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NOTES ON A JOURNEY THROUGH SHENSI

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Map following p. 402.

[NOTE: The names in this paper and accompanying map are spelled by the author on the Wade system, but without the usual separation into syllables by hyphens, and without the short mark over the *u* in the syllable -tzŭ. The spelling of names of Provinces has been altered by us to conform to the Postal Guide. All other names have been left as the author wrote them, pending decision of the question how to reconcile names not in the Postal Guide with the Postal system, which has been adopted as authoritative by the International Map Committee and by H.B.M. Legation in Peking.—ED. *G. J.*]

THE following notes on a journey through Shensi accompany a map of that province compiled from a prismatic compass traverse of our routes, an up-to-date Chinese map, and local information. Along our routes are marked all district cities (*hsien*), townships (*chen*), the larger villages, and a few smaller places convenient for halts; elsewhere only the district cities and the more important townships. All the district cities in China have now been reduced to the rank of *hsien*, and some have been renamed, but the terminations *fu*, *chou*, *t'ing*, etc., have been retained in these notes and on the map, since in unofficial circles the towns in question continue in most cases to be so referred to; the new names have been inserted in brackets. The heights are only rough approximations, being taken from the readings of two aneròids; as we were travelling in circles there were various opportunities for checking them. The journey being made on official business was carried out with the help of the local and provincial authorities, to whom we were much indebted; their assistance enabled us to visit many out-of-the-way parts, and did much to mitigate the hardships of a four months' tour in such rough mountainous country.

1. From T'ungkuan at the Huang Ho (Yellow River) bend *viâ* Lonan Hsien, Shang Chou, Shanyang Hsien, and Chenan Hsien to Hsingan Fu on the Han River. 965 li.*

This is a cross-country journey by little frequented mountain trails, just passable for loaded mules, running from north-east to south-west from

* The li in Central and Northern Shensi average 10 to 3 miles; in the Han basin 12 to 3 miles, like the Szechwan li, the difference being doubtless due to animal and coolie transport in the north and south respectively.

valley to valley across the parallel spurs of the Ch'inling Shan, or Nan Shan, which here trend from north-west to south-east.

The trail runs due south from T'ungkuan and crosses the main range of the Ch'inling Shan (not however here the Yangtze-Yellow River watershed) by a pass not quite 6000 feet high on the first day's march. In crossing this barrier range, here as elsewhere, one passes from North into Central China, and bare stony mountains sloping down to dusty loess hills and plains give way to well-timbered ridges, fertile rice-growing valleys, and clear mountain streams. Lonan Hsien, which is reached after two days' march from T'ungkuan, is an isolated little city lying on a sort of plateau consisting of flat open valleys and low hills of red clay near the sources of the Lo Ho. The latter flows past Honan Fu into the Yellow River, so that the inconspicuous hills of red clay bounding the Lonan plateau on the south form in this neighbourhood the Yangtze–Yellow River divide.

From Lonan Hsien the path follows up one of the headwater valleys of the Lo Ho, and then drops abruptly over the edge of the plateau into a deep winding ravine in red sandstone mountains which eventually debouches after a long day's march into the valley of the Tan Chiang near Shang Chou.

Shang Chou is nowadays a poor place, though it is a *hsien* city of the first class and was formerly a *chou* in charge of four surrounding districts. The proximity of the mart of Lungchuchai detracts from its commercial importance. It lies on one of the chief trade routes in and out of Shensi, that from Hsian Fu to Lant'ien Hsien, across the Ch'inling Shan by a low pass, and down the valley of the Tan Chiang to Lungchuchai, whence at high water boats ply *viâ* Chingtzu Kuan, the likin station in Honan, to Laoho K'ou on the Han River and Hankow, though the traffic on this route has much diminished now that the railway from Honan Fu has reached to within four days' march of T'ungkuan.

From Shang Chou to Shanyang Hsien is two days' march, the trail making a *détour* to the west to get across the watershed between the two valleys. The country, composed of red sandstone ridges trending south-east, sufficiently well timbered and intersected by narrow fertile valleys, is quite attractive and moderately easy to traverse. Villages are scarce, but there are many scattered farmsteads, and the hilltops are often crowned with *chaitzu*, the walled mountain strongholds which form a characteristic feature of south-eastern Shensi and parts of Szechwan. Six years ago the *chaitzu*, like the city walls, were little more than picturesque and dilapidated objects of interest. Most of them have now been repaired and have been in pretty constant use during the almost incessant troubles since the revolution of 1911 as refuges from the bands of rebels, revolted soldiery, and brigands, who roam the mountainous districts and prey on the people.

Shanyang Hsien is a tiny place lost in a wilderness of red sandstone hills backed by mountains. It lies on a recognized but little-used road from Shang Chou due south to the Han River *viâ* Manch'uan Kuan on the

Hupeh border, whence the Chia Ho is navigable by small boats to its confluence with the Han near Paiho Hsien.

From Shanyang Hsien to Chenan Hsien is a three days' journey across the watershed between the headwaters of the Shech'uan Ho (lower down Chia Ho) and the valley of the Ch'ienyu Ho, flowing past Hsiaoyi T'ing and Chenan Hsien. Nearly all the farmsteads along this road were destroyed by the "White Wolf" rebels, who passed in and out of Shensi in scattered bands by out-of-the-way trails through these mountains three years ago. Some have been rebuilt, though always on a different site, and the endless succession of burnt-out homesteads will long testify to the dreadful havoc wrought by these modern T'aip'ings, who left a similar trail of desolation all the way from Honan to Kansu and back. It is against visitations of this kind that the people provide themselves with *chaitzu* on the mountain-tops so that they may save themselves and their families though their farms in the valley are destroyed.

Chenan Hsien is a dilapidated little place lying in the mountains just off the deep narrow valley of the Ch'ienyu Ho. The district, however, is not as poor as it appears to be. There is much good rice land in the bottom of the valleys, the lower hill-slopes are thickly dotted with wood-oil, varnish, and fruit trees, the former a pretty sight in blossom in April, and the surrounding mountains are said by the Chinese to be rich in minerals, copper, iron, asbestos, and antimony.

From Chenan Hsien the path runs down the Ch'ienyu Ho for two days to its junction with the Hsun Ho, whence small boats can descend the combined stream to Hsunyang Hsien on the Han River. The Ch'ienyu Ho flows through deep winding gorges, and the footpath ledged in the cliff side being too narrow for animals, mules and ponies have to make their way as best they can down the stream-bed, which soon becomes impassable when the water rises. Half a day's march below the junction of the two streams we left the river at the village of Chaochiawan to cut across the mountains south-west to Hsingan, two days' journey across the usual ridges trending south-east across the path. It is only when one climbs out of this gorge that one realizes its depth, the first ridge being more than 2000 feet above the river. Three more ridges have to be crossed, and from the top of the last one there is a fine panoramic view over the Han valley. One thousand five hundred feet below and twenty li away lies the city of Hsingan Fu, with the Han River emerging from gorges, flowing through a small plain past the foreground of the picture, and disappearing in the mountains to the left; across the river to the south rise tier on tier of hills and mountains towards the Szechwan border; and on the right a glimpse is caught across low red hills of the valley plain of the Yo Ho, stretching away westwards towards Hanyin T'ing, a natural opening through the mountains up which a railway must one day run to Hanchung Fu.

Hsingan Fu, now officially known as Ank'ang Hsien, a first-class district city, is at present a rough and backward place, but it is probably

destined to be a commercial mart of considerable importance in the future. The Han basin in Shensi may be compared to a miniature edition of Szechwan, a rich but inaccessible region surrounded on all sides by mountain barriers, with Hanchung, the seat of the administration, comparable to Chengtu; Hsingan, the commercial gateway, to Chungking; and the Han, with its gorges and rapids, to the Yangtzu. The Han basin has often been described as an extremely rich region, and the people appear remarkably prosperous and wealthy, perhaps especially so to one coming amongst them from the north; rice is cheaper at Hanchung even than in Szechwan. The Hanchung plain and the innumerable little fertile valleys of this region are noted for a great variety of products, most of which are shipped from Hsingan by junk, down the Han River to Hankow, notably wood oil, varnish, silk, tea, medicines, vegetable wax, paper, hemp, bristles hides, feathers, hemp, bean oil, seed oil, cereals, edible fungus, cotton, coal, etc. Steam navigation on the Han River between Hsingan and Hankow is probably quite out of the question owing to the shallows, strong current, and shifting channel, but there is a very large junk traffic, the worst and most dangerous rapids lying further up stream. A railway will, it is hoped, penetrate southern Shensi from Hupeh in a few years time, and Hsingan Fu will then have a strong claim to be opened as a Treaty Port.

The route from T'ungkuan T'ing to Hsingan Fu gives a good idea of the nature of the ranges of mountains commonly known to foreigners as the Ch'inling Shan at their eastern and lower end. All the way one is crossing ridge after ridge trending south-east composed of red sandstone, shale, and limestone, the former predominating on the lower slopes. The constant south-east trend of these ridges seems to start from the culminating point of the range, the T'aipai Shan, whence one series of ranges runs east along the edge of the Wei valley plain, and another strikes south-east right across the Han basin and causes the succession of gorges through which the Han River breaks its way from below Yang Hsien to the Hupeh border; similarly, west of T'aipai Shan one series of ranges runs west into Kansu, where it continues to form the Yangtze–Yellow River watershed, and another strikes south-west as the divide between the headwaters of the Han and Chialing Rivers. From T'aipai Shan itself streams flow down in all directions. The Chinese apply the name Ch'inling strictly speaking exclusively to the passes in the Yangtze–Yellow River watershed range. The mass of mountains which fill up the whole of southern Shensi from the Wei River south to the Szechwan border, and through which the Han flows in a deep and narrow trough, are universally known locally as the Nan Shan, as opposed to the mountains of northern Shensi, which are always referred to as Pei Shan.

2. From Hsingan Fu on the Han River *viâ* Hanyin T'ing, Shihch'uan Hsien, and Hsihsiang Hsien to Hanchung Fu on the Han River. 650 li.

GORGES OF CH'IENYU HO BELOW CHENAN, SOUTH-EAST SHENSI

HILL FORTRESS (CHAITZU) ON CH'IENYU HO, BELOW CHENAN, SOUTH-EAST SHENSI

GORGES OF HAN HO LOOKING NORTH ABOVE SHIHCH'UAN

IN THE CENTRAL CH'INLING SHAN ON ROAD TO FOP'ING AT NINE THOUSAND FEET

This route, though much of the way only a mountain footpath 18 inches wide, is the main road up the Han basin. Most of the traffic however goes by river. Like most of the roads in the Han basin it is really a track for carrying-coolies, but mules and ponies can travel on it easily enough except for one stage along the Han River beyond Shihch'uan, which is dangerous for pack-animals in places. As the main road connecting two such important places as Hsingan Fu and Hanchung Fu it well illustrates the roadless condition of China. Nor in these days when the activities of Chinese and foreigners are concentrated, without too much success, on railway construction, is it likely that China will ever be provided with roads as the term is understood in other civilized countries. Yet a series of macadamized trunk roads suitable for motor traffic would be an inestimable boon economically and politically to the people and the country, and could be constructed at comparatively small cost.

Leaving Hsingan Fu the path follows up the valley of the Yo (Yueh) Ho to Hanyin T'ing and crosses a low divide to reach the Han River and Shihch'uan Hsien. From Shihch'uan it runs for one stage up the gorges of the Han River, a smaller edition of those of the Yangtze, being ledged in the cliff side over the water, and then strikes across the lower slopes of the mountains which rise between the Han River and the Szechwan border to Hsihsiang Hsien. Hanyin, Shihch'uan and Hsihsiang are all prosperous little cities producing a great deal of coarse silk, which is consumed locally and exported to Kansu. The population is largely composed of Szechwanese, whose fathers migrated to this region after it had been almost completely depopulated by the T'aip'ings fifty years ago. The whole area of the Han basin greatly resembles Szechwan, of which it was once a part. From Hsihsiang the path follows up the valley of the Muma Ho, like nearly all the streams of the Han basin navigable by small boats on its lower reaches, and then, threading its way for a couple of days through a maze of little wooded hills intersected by gullies growing rice, the foothills of the mountains to the south, finally emerges on to the Hanchung plain just beyond the Roman Catholic stronghold of Kulupa, where the Italian fathers have been established for many years on a fortified hilltop. The Roman Church has established itself very firmly in this corner of Shensi, and has acquired great power and influence in the neighbourhood. Half a day's march across the fertile plain brings one to Hanchung Fu, the seat of the Taoyin and General, and the capital of the whole Han basin.

Hanchung Fu, now known officially as Nancheng Hsien, a first-class district city, is one of the wealthiest and most populous cities in the province owing to its position in the centre of an immensely fertile plain at the junction of several important roads, notably the Sian–Ch'engtu high-road with the Han waterway. Such a position affords unrivalled opportunities for the imposition of likin dues, with the result that trade and traffic are being driven out to a township called Shihpali P'u outside

the east suburb, which is developing into the busiest of towns. The surrounding plain, which was formerly devoted largely to the opium poppy, now produces great quantities of wheat, rice, and other useful crops, two in a season.

According to the press the new American Railway Group have recently secured the concession for the construction of a line from Laoho K'ou on the Han River in Hupeh to Hsingan Fu, and thence up the Han basin to Hanchung Fu. Such a line with its immense possibilities forms one of the most interesting and attractive of the many railway concessions waiting to be carried into effect in China. It should not prove so very difficult to construct, at any rate as far as Hsingan Fu, whether it follows up the Han River or outflanks the mountains on the Hupeh–Shensi border by taking the Chuch'i–P'ingli route. From Hsingan Fu the rich open valley of the Yo Ho leading to Hanyin T'ing seems to have been specially provided by nature to enable a railway to get round the gorges of the Han River in this neighbourhood. Shihch'uan Hsien can probably be reached without much difficulty, after which, however, it would appear that considerable obstacles will have to be surmounted before reaching the Hanchung plain. Probably a route *viâ* Hsihsiang Hsien and the Muma Ho valley will prove the best, and the former is a rich and important centre which ought to be touched. Such a railway would not only open up the rich but backward regions of the Han basin, but would also solve the great problem of the railway penetration of Szechwan. Once the railway reaches the upper Han valley above Hsingan Fu, the task of getting across the low divide into the basin of the upper Yangtze in north-east Szechwan will be easy compared to that which has for so long faced the engineers of the American section of the Hukuang Railways at Ichang. The Belgians already have a concession for the construction of such a line into Szechwan from the western end of the Han valley, but they have first to surmount a tremendous obstacle in the passage of the Ch'inling Shan.

3. From Hanchung Fu *viâ* Ch'engku Hsien, Yang Hsien, Fop'ing T'ing, Chouchih Hsien, and Mei Hsien to Fenghsiang Fu in the Wei basin. 835 li.

This is an alternative route connecting Hanchung Fu and the upper Han valley with Fenghsiang Fu, Hsian Fu and the Wei valley, to the main road *viâ* Feng Hsien and Liupa T'ing (the Peking–Szechwan road). This Fop'ing route, which crosses the eastern spurs of the T'aipai Shan, is a very rough mountain trail, just practicable for pack-mules, and is nowadays little frequented except by isolated carrying-coolies, smugglers, and others with good reasons for avoiding the main road. Although there is a considerable saving of distance as between Hanchung Fu and Hsian Fu by this route compared to the main road (about 800 li and 1000 li respectively), the ordinary Chinese official or merchant practically never

travels by it, because, owing to the many steep passes, it is necessary to do a good part of the journey on foot.

The Ch'inling Shan, or Nan Shan, which consist of a series of precipitous parallel ranges trending across the path of any one travelling between south and north, have always proved an extraordinarily effective barrier to communication between the Han and Wei valleys, especially south of Hsian Fu. It was this barrier which prevented the T'aip'ing rebellion from spreading north of the Han basin, and the Mohammedan rebellion from spreading south of the Wei valley; and in modern times it has kept the upper Han valley comparatively peaceful while revolution, rebellion, and brigandage succeed one another in the Wei valley and northern Shensi. The Chinese have always rested content with two recognized main routes across this barrier, one at each end: the Hsian Fu–Lungchuchai road in the extreme east, and the Fenghsiang–Liupa–Hanchung road in the extreme west. There is one other route which is considered just passable by Chinese travellers in chairs, the road from Hsian to Hsingan *viâ* Ningshan and Shihch'uan. The remaining three routes, that in the east *viâ* Chenan, that in the centre *viâ* Fop'ing, and that in the west from Mei Hsien to Liupa, the two latter passing one on each side of T'aipai Shan, are considered by the Chinese impracticable for ordinary travelling.

The Belgian railway from Tat'ung in North Shansi *viâ* Hsian and Hanchung in Shensi to Ch'engtu in Szechwan (work not yet commenced) has to cross this barrier somewhere. It has sometimes been stated that it will follow the Fop'ing road. Unless a practicable route for a line has been found up the gorges of the Chouchih River (Hei Ho), by tunnel through the watershed, and down the gorges of the Ch'engku River into the Han valley, which seems improbable to any one acquainted with the country, the construction of a railway across the Ch'inling Shan *viâ* Fop'ing seems scarcely practicable. Indeed, to build a line across the Ch'inling Shan by any other route than that of the Tan Chiang in the east, which leads in the wrong direction for this project, is likely to prove difficult and costly. Perhaps the easiest route will be found to lie in the west, from the Wei valley into the basin of the Chialing Chiang rather than that of the Han.

Leaving Hanchung Fu the road runs for two days down the fertile valley plain past Ch'engku Hsien to Yang Hsien, two prosperous district cities. Ch'engku especially vies with Hanchung in the wealth and prosperity of its inhabitants. Yang Hsien is a smaller place, but also flourishing, and is the centre of cotton cultivation in the Han valley. A good deal of it goes across the Han–Chialing–Chiang portage and down the latter to Chungking, whence it reaches the coast as Szechwan produce. Cotton has always been one of the staple crops of Shensi, especially in the plains of the Wei valley, and is now being increasingly cultivated owing to the high prices ruling and as a substitute for the opium

poppy. On the Hanchung plain it is apt to suffer from being put into the ground rather late, as it follows a spring crop; whereas in central Shensi it usually has the ground to itself for a season. There is doubtless a great future for cotton cultivation in Shensi; only it must be noted that the people live purely and simply on their crops, so that the production of wheat cannot be greatly curtailed without serious results.

From Yang Hsien the trail strikes north, and crossing two ridges, 4400 feet and 5500 feet in height, descends to the township of Huayang Chen, lying in a little rice plain at the junction of several ravines surrounded by wooded mountains. The height limit for rice in Shensi is about 4000 feet. The 130 li between Yang Hsien and Huayang are rough and arduous, but the chief difficulties of this route now begin. Between Huayang and Fop'ing four passes are crossed by a very bad trail, varying from 7000 to 9000 feet, with steep descents into deep narrow gorges between. The country is composed of precipitous mountain ranges trending east and west, densely wooded with pine, birch, and thickets of dwarf bamboo, and practically uninhabited save for an occasional hut surrounded by patches of potatoes. The highest pass, the Hsinglung Ling, is the easiest, as the valleys leading up to it on either side are flat and glacierlike, in contrast to the usual narrow gorge.

Fop'ing, formerly a *T'ing* and now a third-class *Hsien*, is a tiny place, a mere walled hamlet, lying at an elevation of over 6000 feet in a cultivated valley surrounded by lofty mountains. T'aipaishan lies close by to the north-west. It must be one of the smallest and most miserable *hsien* cities in China Proper, and the district one of the poorest. Wheat, barley, maize, and potatoes are grown, but the wheat was only just showing above ground in the middle of May, when it was ripening for harvest in the Hanchung plain, and appears to be an unreliable crop. Potatoes are the staple crop, but a succession of poor harvests during recent years has led to something like an exodus of the population, and consequently to the partial abandonment of the trails through the district, which is interesting because it includes some of the highest ranges and peaks of the Ch'inling Shan and the headwaters of streams flowing north, south, east, and west. The high wooded ranges to the north and south are rich in big game, bear, leopard, goral, takin, pig, and great numbers of deer, and pheasants are thick in the neighbourhood of any cultivation. When the railway reaches Hanchung a month in Fop'ing in the autumn will be an attractive way of spending a holiday.

In my experience the *T'ing*, usually translated sub-prefecture and now abolished, was formerly the centre of a sort of military district located in mountainous country for the purpose of holding aboriginal tribesmen of some kind in check and protecting the Chinese colonists against them. Thus, for instance, one will find many *T'ing* on the western confines of Yunnan, Szechwan, and Kansu facing the Tibetans; in the Miaotzu country of Kweichow and the adjacent provinces; on the borders of

Lololand in Szechwan; on the Burma–Yunnan frontier; and in Northern Shansi on the Mongolian border; but not in provinces like Anhwei, Kiangsu, Shantung, etc., where there has apparently never since the dawn of history been a non-Chinese population. There are a number of *T'ing* in the Nan Shan of Shensi, and there should therefore have been at one period a Miaotzu or aboriginal population of some kind in those parts; but I could never find any evidence locally in support of this theory. Incidentally it may be noted that the *T'ing* are usually marked on foreign maps of China as more important places than most of the *Hsien*. But as a matter of fact nine out of ten *T'ing* are miserable little places, ranking as the very poorest of third-class district cities.

From Fop'ing the path climbs straight up the mountain-side to the north of the city, and drops down into the usual narrow wooded gorge beyond. This ridge, less than 1000 feet above the valleys on either side, is here the Yangtze–Yellow River divide, the streams on the further side all flowing down from T'aipai Shan into a river called the Hei Ho, which joins the Wei near Chouchih Hsien. The trail, however, does not follow down the winding gorges of the Hei Ho to the plain, but leads north-east across a series of spurs running down from T'aipai Shan; so that the three days between Fop'ing and the plain, during which five passes have to be crossed, are scarcely less arduous than those on the other side. The highest and most difficult of these passes is the Laochunling (7500 feet), crossed on the second day; from the last pass there is a fine view over the Wei valley, 4000 feet below.

On some foreign maps of Shensi an entirely different route is marked from Yang Hsien through the Ch'inling Shan *viâ* Fop'ing to Chouchih, only touching the trail at present in use at Huayang and Fop'ing, and apparently running down the gorges of the Hei Ho. Nothing seems to be known locally nowadays of this road, which may be an old trail destroyed by the streams in flood and abandoned.

Chouchih, a first-class *hsien* city, is the centre of one of the rich agricultural districts of the Wei valley. The surrounding plain was formerly covered with the poppy, and the opium-sodden population were usually short of grain; now it is one vast wheatfield, and food is plentiful. Travelling through central Shensi in the early summer, one cannot fail to be impressed by the immense amount of wheat nowadays produced on these undulating plains, which recall the wheat prairies of Canada. There appears to be usually a good surplus available for export, but lack of means of communication prevents the harvests being moved any distance. The harvesting, carried out of course entirely by hand, is a period of intense activity, and large numbers of labourers come down from Kansu to assist. These men are met with in crowds in May on the small trails leading down from the north-west into the plains. After the harvest is over in the Wei valley they work back across the plateau of West Shensi to their native uplands, harvesting according to the elevation as they go.

The people of North Shensi and Kansu live practically on wheat alone, and the foreign traveller will find the best flour and the best native bread and vermicelli in China in these two provinces.

From Chouchih Hsien we travelled up the Wei valley to Mei Hsien, and thence north-west to Fenghsiang Fu, all the way across undulating wheat-covered prairies, except for half a day's march above Mei Hsien, where indigo monopolized the rich irrigated land along the river, dotted with the peculiar-looking brick pits for the preparation of the dye. This indigo was destined for Kansu, where the stocks of aniline dyes appear to be exhausted. Fenghsiang Fu, which lies near the western end of the Wei valley plains, is nowadays a poor place, having never recovered its former commercial prosperity after the revolution of 1911 and during the troubles which have afflicted Central Shensi at intervals ever since.

4. From Fenghsiang Fu *viâ* Linyu Hsien, Yungshou Hsien, and Ch'unhua Hsien to Yao Chou. 510 li.

This is a cross-country journey through the elevated loess country of Western Shensi by small mule-trails connecting one district city with another.

From Fenghsiang to Linyu is an easy two days' march across the range of mountains (the Ch'i Shan), which here bound the plains of the Wei basin on the north. Linyu itself is a tiny place, a third-class *hsien* city hidden away in brigand-infested loess mountains not far from the Kansu border. Wheat is grown in terraces on the mountains, but the district is very poor, with its sparse population living in scattered cave hamlets. Many terraced mountain-sides are grass-grown and out of cultivation, a common sight in North Shensi and Kansu.

From Linyu Hsien to Yungshou Hsien is rather an interesting march, as the path runs most of the way along a high ridge with extensive views over this peculiar loess country. Leaving Linyu and the valley, the path ascends the hills to the north to gain the village of Tsuimu, perched up on the top of a ridge between 4000 and 5000 feet high. It is an agreeable peculiarity of loess mountain country that the paths follow, where possible, along spurs and ridges rather than the valleys, and Tsuimu lies on a sort of knot where several ridges and therefore mule-trails meet. Consequently, though only a dot of a place, it boasts a likin station and commands two trails into Kansu. From Tsuimu to Yungshou Hsien the path follows along the top of a winding ridge, actually the summit of the range which protects this portion of Western Shensi against Mohammedan Kansu, with very extensive views on either side. To the south a series of loess spurs and intervening ravines fall away steeply towards the Linyu valley, beyond which the Ch'i Shan range is seen to end as Yungshou is approached, in the rolling plains of the Wei and its tributaries; and to the north across an intervening hollow rises like a wall the edge of the loess plateau country of Eastern Kansu. These loess-clad ridges of

Western Shensi seem to be pieces broken off from the Kansu plateau, like the mountains along the southern edge of the Mongolian plateau in North China. Where the loess has been washed away shales and sandstones are revealed, and often right on the top of the spurs a sort of conglomerate of waterworn pebbles cemented together, which in places gets broken up by the trail so as to resemble pebbles in a stream-bed. Yungshou Hsien lies just below the top of the ridge, and is a replica of Linyu, except that it is rather more alive, as it lies on the great cart-road from Hsian Fu to Kansu and Turkestan.

From Yungshou the trail continues along the ridge to the east till the latter merges after half a day's march into a vast loess plateau surrounded by outcroppings of isolated mountains. This plateau includes parts or the whole of the districts of Pin Chou, Ch'angwu, Sanshui, Yungshou, Ch'unhua, and Yao Chou, and reaches in the north-west a height of over 4000 feet. It has a marked slope to the south-east, and is intersected by the deep canyon of the Ching Ho and the ravines of many other streams all flowing in the same direction, and by innumerable rifts and crevasses in the loess from 10 to 500 feet in depth. Travel up and down this plateau along its slope between north-west and south-east is easy, but transversely from east to west, the line of our march, most trying and arduous, owing to the necessity of constantly crossing the perpendicular rifts in the loess, varying from the tremendous canyon of the Ching Ho nearly 1000 feet in depth to a dry crevasse of 100 feet. In order as much as possible to avoid these rifts, which increase in size and frequency as the plateau slope descends, our path, after crossing the Ching Ho, an unfordable torrent of liquid mud flowing at the bottom of a deep canyon, kept to the high ground, and consequently made a long détour to the north, finally descending with the slope of the land to Ch'unhua, thence again working north and descending on Yao Chou. On the upper portion of this plateau there are extensive prairies, uncultivated and covered with poor grass; so that one might imagine oneself in Inner Mongolia, until, on attempting to cross the plain away from the road, one almost immediately fetches up against a chasm in the loess with perpendicular sides several hundreds of feet deep.

Writing without access to books of any kind, I am unaware what the modern theory as regards the origin of the loess may be. The Chinese all take it for granted that these extraordinary deposits were caused by water, *i.e.* by the great floods which according to their historical records once submerged north-west China at about the same period as those of the Bible. The longer one travels in the loess country the more evidence there appears to be in support of such a theory. Without entering into a discussion on the subject the following points may be mentioned: the general slope of the loess uplands always coinciding with the direction of the rivers and streams, *i.e.* all draining south-east; the regularity of level and depth of the loess over wide areas; the strong

resemblance of parts of the plateaux, where almost surrounded by outcroppings of low mountains, to old lake-basins, some of which, it appears, still contain water, though we did not happen to come across such; the existence everywhere of a layer of mixed loess and waterworn pebbles immediately above the rock on which the loess rests (which is exposed in every rift or ravine that extends down to the underlying rock); the meeting-line between the light sandy loess and the heavier reddish loess can sometimes be traced for miles at the same level. The loess has nowhere, except in the extreme west, crossed the Ch'inling Shan, a continuous range, whereas it is piled high on either side of other high ranges which are not continuous.

5. From Yao Chou *viâ* T'ungkuan Hsien, Yichun Hsien, Chungpu Hsien, Loch'uan Hsien, Fo Chou, and Kanch'uan Hsien to Yenan Fu and Yench'ang Hsien. 670 li.

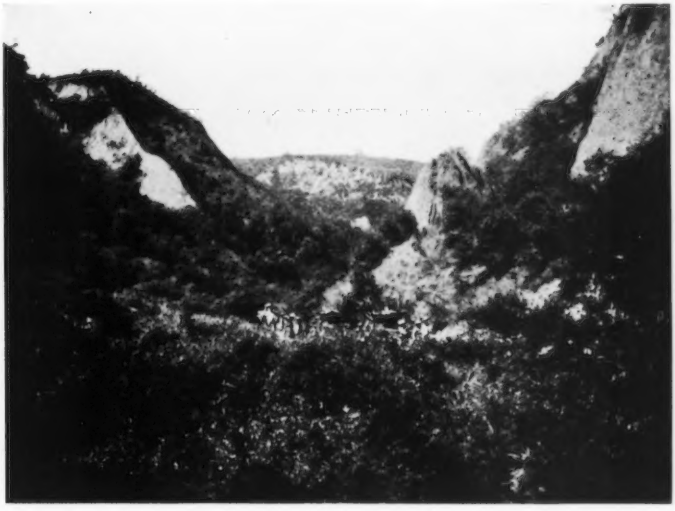
This is the main road from Hsian Fu to the Yench'ang oilfield and the north of the province generally.

Between T'ungkuan, one stage north of Yao Chou, and Chungpu a range of mountains rising well above the loess, and forming the watershed between the Lo and Wei Rivers, is crossed by a pass about 5000 feet high. Probably the soil of no region in the world has been worked by man to anything like the same extent as the loess of the Wei valley, where the Chinese have been scratching, sowing, and reaping since the dawn of their history, and the whole landscape seems tired and worn out. It is therefore a relief, especially in the summer, to get out of the loess for a day or two, with its alternate dust and mud, insufficient and often brackish water-supply, and its treeless and monotonous scenery, into these mountains with their clear streams, grassy downs, and brush-covered slopes, haunted by innumerable deer and pheasants.

From Yichun Hsien, which lies perched up on a spur of these mountains, the trail descends to Chungpu, crosses the Lo River flowing in a deep narrow valley in the loess, and ascends to Loch'uan Hsien, which lies on the usual loess plateau, cut up in all directions by enormous rifts. From Loch'uan one drops back into the Lo River valley, which is followed up past Fu Chou to Kanch'uan Hsien. Between Kanch'uan and Yenan Fu another range is crossed, trending like nearly all the mountains and rivers of Shensi from north-west to south-east, and serving as the divide between the upper Lo Ho and the Yen Shui. These mountains scarcely emerge above the loess, but being uninhabited are yet covered with a comparatively luxuriant vegetation of scrub and jungle.

As one proceeds north the country becomes poorer and more arid, and round Yenan Fu practically no wheat is grown, the sparse population subsisting on one autumn crop such as millet. Outside the walled cities the people live almost entirely in caves in the loess or in square earth huts with cave interiors. Scarcity of wood for roofing purposes is said to

CHING HO IN CAÑON EIGHT HUNDRED FEET DEEP IN LOESS PLATEAU BETWEEN TUNGSHOU AND SANSHUI, WEST SHENSI



JUNGLE-CLAD SUMMIT LOESS DIVIDE BETWEEN LO HU AND YENSHUI, NORTH SHENSI

YENCH'ANG HSIEN AND OIL WELL, NORTH SHENSI

STONE CAUSEWAY OVER LOESS RIFT, NEAR HANCH'ENG ON THE YELLOW RIVER, EAST SHENSI

be the reason for digging these queer artificial caves. A great deal of land has gone out of cultivation, as evidenced by the grass-grown terraces on the mountain-sides; the towns and villages are mostly in ruins, and the people poor to the verge of starvation. There are various reasons to account for this state of affairs, the chief being the depredations of brigands, to whom the whole region has been practically abandoned for the past few years. Possibly also the whole of northern Shensi and north-east Kansu are drying up, so as to be incapable of supporting as large a population as in former generations. The district cities are mere empty shells mostly in ruins, and Yenan Fu itself is little better. Trade and traffic are absolutely dead, and only soldiers, brigands, or the poorest of coolies are ever met with on the roads. Further north, round Suite Chou and Yulin Fu, conditions are said to be somewhat better, Yenan being the centre of the most desolate area.

Although ruins, poverty, and general decay are the predominant features along this road to-day, there is much of interest in the dilapidated *hsien* cities *en route*, with their origins lost in dim and almost prehistorical times. Near Chungpu is the tomb of the Emperor Huang Ti, who reigned some 4000 years ago, and Fu Chou and Yenan Fu, now in the last stages of decay, were for thousands of years important fortresses guarding this gateway into the heart of ancient China against the hordes of Huns, Turks, and Mongols from the north.

From Yenan Fu to Yench'ang Hsien is two days' march down the valley of the Yen Shui, cutting across the loess plateau to the north for half a stage on the second day. Yench'ang is the usual miserable little district city of north Shensi, but it is of some interest owing to the oil wells. The oil used to flow out of the ground into the Yen Shui, but about 1906 some one conceived the idea of exploiting it. Two wells were sunk and fitted with Japanese machinery, and they have produced a steady flow of oil ever since. Some eight years later the Standard Oil Company took the matter up, negotiated a co-operative agreement with the Chinese Government, and started in to exploit the supposed oilfield of north Shensi on modern lines. Geologists, drillers, and machinery were imported from the States, several wells were sunk, and visions of busy oilfields, pipe lines, railways, and general wealth and prosperity arose in the minds of the local Chinese. But unfortunately no oil was discovered save in the immediate neighbourhood of the original Yench'ang wells, and after two years or so of great activity, the enterprise was abandoned and the Americans departed, to the great regret of the local Chinese. The original wells still produce a steady flow of oil working with the original machinery. The concern flourishes in a small way, and sells as much oil, principally across the Yellow River in north Shansi, as it can refine, and as the deficient transport facilities at its disposal enables it to distribute. Only one well therefore is usually at work.

Yench'ang Hsien boasts rather superior walls, and is distinguished by the fact that it is one of the few district cities in northern Shensi which has not been sacked by brigands during the past year or two. This immunity from the prevailing evil is also partly due to the beneficent oil. In the embrasures all round the walls every yard or so are placed pans of crude oil, which, lit up at night-time, illuminate the whole city and neighbourhood in a remarkable manner. The effect on any one not expecting it is extremely startling. Night after night throughout the year the desolate little city lost in the wilds of north Shensi indulges in this orgy of illumination. However, it appears to be successful in scaring off the brigands, who usually make their raids on dark nights. Perhaps the prospect of having a pan of burning oil upset over their heads deters them also.

The mineral wealth of northern Shensi includes, as well as the oil, a good deal of coal and iron according to Chinese reports. But the means of communication are so bad that it is useless except for local consumption.

6. From Yench'ang Hsien *viâ* Yich'uan Hsien to Hanch'eng Hsien on the Yellow River. 415 li.

This is an exceedingly hard five days' march through the wild brigand-infested mountains a little inland from the Yellow River. The country is poor in the extreme, the few hamlets mostly in ruins, the farms abandoned, and the fields untilled.

Between Yench'ang and Yich'uan two divides in the loess are crossed, the first being the higher and having more the character of a loess-covered range. In between there is a descent to a stream called the Yunai Ho flowing eastwards to the Yellow River in the usual rocky bed at the bottom of a deep narrow valley in the loess. The loess plateau itself is here so cut up by rifts, valleys, and ravines as to take the form of a series of flat-topped ridges running down from the divide on either side. Immediately to the south of Yich'uan, an empty and deserted city, rises a formidable barrier range running more or less east and west. The ascent to the pass (the Lut'ou Ling, 5100 feet) is over loess almost to the top. But once across the pass there is a complete change of scenery, and the loess proper is not seen again until one emerges from the mountains half a day's march north of Hanch'eng. These mountains consist of a series of precipitous ridges which strike the Yellow River and cause the gorges and rapids which impede its course in that neighbourhood. The trail works its way from valley to valley, gradually approaching the Yellow River where patches of loess begin to reappear. Five passes are crossed between Yich'uan and Hanch'eng, decreasing in altitude as one goes south, and from the last the trail drops to the plains close to the mouth of the famous Lungmen gorges, where the Yellow River emerges from the mountains. Tradition relates that the Emperor Yu cut a channel through the moun-

tains at this point and thus liberated the floods which until that time had submerged the whole of North-West China, bringing into existence the Yellow River and the fertile deposits of "yellow earth" in Shensi and Kansu. When one finally gets down to the plain, one finds that it is not really a plain at all, but the usual plateau of loess, here only of moderate thickness, sloping down towards the Yellow River.

Hanch'eng Hsien lies in a basin-like valley below the level of the plateau. It is a prosperous city for Shensi, though only a second-class district, and appears rich and well populated to any one reaching it from the desolate north. The irrigated valley land round the city was mostly under indigo at the time of our visit, and the district is noted for that and for its cotton, hemp, and vegetable oil. The proximity of Shansi probably accounts in part for the superior appearance of Hanch'eng; for compared with Shensi, Shansi is prosperous and law abiding.

7. From Hanch'eng Hsien on the Yellow River *viâ* Hoyang Hsien, Ch'engch'eng Hsien, P'uch'eng Hsien, Fup'ing Hsien, and Sanyuan Hsien to Hsian Fu. 480 li.

This is a week's journey across the wheat-growing loess uplands of Central Shensi. A slightly shorter road to Hsian *viâ* T'ungchou Fu runs across the plain. A long day's march on the first day brings one to Hoyang, after an ascent from the level of the Yellow River to the top of the loess plateau; then follows a short stage to Ch'engch'eng; then a very long day which includes the crossing of the Lo River to P'uch'eng; and then another long day to Fup'ing. All these marches are across vast undulating wheat prairies. A number of the usual rifts in the loess have to be crossed; but this portion of the plateau being comparatively low, they are more open and less precipitous than further north. Hoyang, Ch'engch'eng, P'uch'eng, and Fup'ing are all the same type of agricultural centre, and, though poor enough in appearance, are all of them the capitals of rich agricultural districts ranking as first class *hsien*. The chief revenues of the provincial Government are now and have always been derived from the land-tax receipts of these and the neighbouring districts of Central Shensi.

Between Fup'ing and Sanyuan the road drops from the uplands down to the plain, and from Sanyuan runs due south for a day's march to Hsian Fu, crossing the Ching Ho and Wei Ho by ferries *en route*. Sanyuan is, or was in normal times, an important business place, a distributing and collecting centre and *entrepot* for the trade of the province, which, as is usually the case, avoids the provincial capital if it can. The plains along the Wei and Ching Rivers are nowadays largely devoted to cotton, to which the soil and climate seem to be particularly well suited.

No attempt has been made in these notes to describe the many objects of historical interest to be found in Central Shensi, the first home of the Chinese race since they became a settled agricultural people, since the

subject is too large and requires special investigation. Amongst the most interesting to the Chinese themselves are the tombs of the Emperors Huang Ti and Ch'in Shih Huang Ti at Chungpu and Lint'ung respectively and of the notorious Imperial concubine Yang *Kuei-fei* near Mawei in Hsingp'ing district. Foreigners usually show more interest in the Nestorian Tablet in the Pei Lin at Hsian Fu. The huge tumuli, some 100 feet high, lying on the elevated ridge of loess between the Wei and Ching Rivers, and said to be the tombs of ancient kings, also rouse interest and curiosity as to what they cover.

8. Hsian Fu to Ch'engtu Fu in Szechwan by the main road. 2250 li.

This route, about the most important overland road in China, is too well known to need much description, but a short account may be of interest in view of the importance that is likely to attach to it when railway construction recommences in China. For it is by this route that the first railway is likely to reach the rich province of Szechwan, the goal of so many railway projects (unless anticipated by the new American concession for a line south from Hsingan and Tzuyang into north-east Szechwan), and along it will one day run one of China's most important trunk lines. Though the introduction of steamers on the upper Yangtze has somewhat diminished the traffic on this road, it is still of great importance as providing practically the only existing means of access to Szechwan from the north. After leaving the Wei valley it is a mule trail, paved most of the way, and comparatively good in Szechwan, but very rough and rocky through the mountains of Shensi. For the tourist who wishes to see the interior of China, a journey from Peking *viâ* Hsian to Ch'engtu by this road, and thence back by river to Shanghai, would provide a tour of great interest through some of the finest scenery of China Proper.

There are only two trails across the great barrier of the Ch'inling Shan in Shensi in common use by Chinese travellers, one at the eastern and the other at the western end of the range, and in order to gain the latter the road runs for the first few days from Hsian Fu west across the rolling loess plains of Central Shensi, through the wheat and cotton growing districts of Hsienyang, Hsingp'ing, Wukung, Fufeng, and Ch'ishan to Paochi near the end of the Wei valley plains. All the way the traveller is accompanied on his left hand by the Ch'inling Shan, rising sheer out of the plain to the south of the Wei River to a height of many thousands of feet, and culminating in the T'aipai Shan, 12,000 feet high, and snowclad until midsummer. To the north the loess rises gently towards the mountains of northern Shensi, till beyond Fufeng Hsien the Ch'i Shan close in on the right.

At Paochi Hsien a gorge runs due south into the Ch'ingling Shan, leading up to a gap in the main range. The descent from this pass leads, however, not into the Han basin, but into the valley of the Tung Ho, a stream flowing down from the south-west slopes of T'aipai, and forming

one of the headwaters of the great Szechwan River, the Chialing Chiang. Two days' march down the Tung Ho, at first through an open valley and then through winding gorges, brings one to the city of Feng Hsien on the confines of Kansu.

There does not seem to be any loess whatsoever in the Han basin, but the mountain-slopes on the headwaters of the Chialing Chiang are freely patched with it, as may be observed in the valley of the Tung Ho above Feng Hsien in Shensi and in the valley leading down to Li Hsien in Kansu from the direction of Ch'in Chou. The presence of this loess south of the main range of the Ch'inling Shan in the west can perhaps be explained by the height of the watershed in that neighbourhood.

The valley leading south from Paochi combined with that of the Tung Ho provides a means of communication for a railway between the Wei valley and the upper Chialing Chiang; and if it is possible to negotiate the limestone gorges of the latter down to Kuangyuan, this may perhaps prove the easiest route for a railway into Szechwan from the north. In that case the Han valley could be connected up by a line across the present portage between Yangp'ingkuan on the Chialing Chiang and the Han Chiang above Mien Hsien, thus avoiding the intricate ranges pierced by the main road between Feng Hsien and Liupa T'ing.

Leaving Feng Hsien, the trail climbs steeply to reach the Feng Ling, a pass with a double summit about 6200 feet high, and then drops almost as far again into the gorge of a mountain torrent, which is, however, still part of the headwaters of the Chialing Chiang. From this valley a side ravine runs eastwards for a day's march into the very heart of the Ch'inling Shan, finally leading by an easy ascent to a pass, the Ch'aikuan Ling, 5500 feet, which gives access to the Han basin. From this pass there is a steep descent through winding gorges to the little mountain city of Liupa T'ing. The Ch'inling ranges are seen at their best near the Ch'aikuan Ling, where the rocky precipices and densely wooded mountain slopes, clear mountain torrents, and narrow fertile ravines, combine to form a landscape of great beauty. Just below the pass on the Liupa side lies the Changliang Miao, beautifully situated at the junction of two wooded ravines, and one of the finest temples in China. It dates back to the Han dynasty, and is very well known amongst the Chinese.

From Liupa to Paoch'eng Hsien, a two days' march, the road, a terribly rough and rocky trail, runs down the gorges of the Pao Shui (sometimes wrongly named the Heilung Chiang on foreign maps), a large stream flowing down from the southern slopes of T'aipai Shan, which debouches suddenly through a precipitous gorge on to the Han valley plain at Paoch'eng.

From Paoch'eng Hsien the road runs up the cigar-shaped Hanchung plain to Mien Hsien, where the converging mountains on either side meet and bring this densely populated and fertile plain abruptly to an end,

much as the Wei valley plains terminate beyond Paochi on the confines of Kansu.

Above Mien Hsien the path continues to follow up the Han, which here flows in a narrow gorge in the mountains for a long day's march to the village of Taian. The Han is remarkable for the suddenness with which it springs into existence as a navigable river. At Mien Hsien in the summer it is already a large river; while at Taian it is a mere streamlet a few inches deep, and one is within a few hours' march of its source; the head of navigation, the village of Hsinwan P'u, being passed halfway between these two places. The portage to Yangp'ingkuan on the Chialing Chiang is only a couple of days' march, and the road is naturally a busy one. At the opposite extreme are the two other chief rivers of Shensi, the Wei and the Lo, which, rising one in Central Kansu and the other on the Ordos border, are only navigable for short distances above their confluence with the Yellow River near T'ungkuan. The contrast is typical of China north and south of the Ch'inlingshan.

From Taian the trail follows up the headwaters of the Han to the south to reach a low pass, the Wuting Kuan, whence it drops down to the picturesque little city of Ningchiang, lying in an isolated valley hemmed in by steep mountains still in the basin of the Han.

Beyond Ningchiang the divide between the Han and the Chialing rivers is crossed by a low pass, and the road crossing the border into Szechwan runs down a series of ravines and valleys to Ch'aot'ien Chen on the Chialing Chiang, which here flows from north to south in deep gorges. At one point, just before reaching Ch'aot'ien and the Chialing, the valley comes to an end and the stream, flowing through a tunnel in the limestone, passes underneath a mountain spur (Lung Men Kuan). From Ch'aot'ien the path runs down the gorges of the Chialing Chiang to Kuangyuan Hsien in north Szechwan.

The ranges on the Shensi–Szechwan border between Mien Hsien and Kuangyuan are rugged and intricate, but they are not to be compared with the Ch'inling Shan as a barrier to communications. The road follows a line of gaps through these mountains, and railway construction between the western end of the Han valley and northern Szechwan is not likely to prove very difficult, at any rate compared with that between the Han and Wei valleys.

From Kuangyuan the road threads its way through the mountains of northern Szechwan, passing through the main range which trends south-west to north-east by the picturesque passage of Chien Men Kuan, south of Chaohua. This range is of a peculiar character, having throughout a gentle slope up from the south and falling away in perpendicular rocky precipices on its northern face, a formation which is also seen south of Ningchiang. The road finally emerges on to the Ch'engtu plain beyond Mien Chou. It is a remarkable road through most intricate mountain country, paved throughout, usually a couple of yards in width,

and much of the way shaded by venerable trees hundreds of years old. Descending into the plain it passes through a succession of rich cities, Mien Chou, Lochiang Hsien, Teyang Hsien, Han Chou, and Hsintu Hsien, the like of which are not to be found in the whole of Shensi and Kansu, and finally reaches Ch'engtu. The latter, about the largest and richest city in China, is now partly in ruins with street after street of wealthy shops and residences burnt down to heaps of rubble as the result of the recent fighting between Szechwan and Yunnan and Kueichow. Ch'engtu has known but little peace since the revolution of 1911, but this last trial is the worst it has yet undergone.

Some account of the route from Hsian Fu in Shensi to Lanchou Fu in Kansu by the main road (1420 li) was given in a paper in the *Journal* a couple of years ago.

WAR SURVEYS IN MESOPOTAMIA

Colonel F. W. Pirrie, C.M.G., C.I.E., I.A., Late Deputy Director of Surveys, Mes.E.F.

(Note: The names are spelled in accordance with the system adopted by the Mesopotamia Expeditionary Force.)

THERE must be many difficulties in meeting the various calls on the Survey of India during this World War, and a report on how these difficulties have been surmounted will be of great interest, and will no doubt be brought out in due time.

Many of the officers reverted to military duty early in the war, and, in addition to maintaining the Survey Department in India, the Surveyor-General had to supply survey establishment to satisfy the needs of overseas Expeditionary Forces in Mesopotamia and elsewhere, and to maintain these by reinforcement according to local conditions.

I am personally concerned only with Mesopotamia, and have been requested to write a note for the *Geographical Journal* on the surveys carried out under my control for the Mesopotamia Expeditionary Force from December 1914 to May 1918.

The area dealt with covers nearly the whole of Southern Mesopotamia, with adjacent territories of Arabia and South-Western Persia. Although the area surveyed is large, and sufficient for all military requirements at present, the amount of work will in all probability be greatly increased before the end of the war, and it is obviously inexpedient at the present time to discuss in detail the areas surveyed or the new methods used for particular purposes. I will confine my note to a description of the work done in general terms, showing how the needs of the field force were met under the varied conditions of ground and climate in Mesopotamia.

The scope of the work was to satisfy the military requirements of the

field force, and at the same time to build up a reliable map of the country on a convenient scale for general purposes. In order to carry out these principles the scale of ½ inch to 1 mile was adopted as the general scale of field surveys, and larger scales were used for special purposes or where the detail was intricate. From these field surveys squared military maps of probable operation areas were prepared by the Map Compilation Section under Intelligence G.H.Q. and issued to the field force. The Vandyke process was much used at Survey Headquarters for the reproduction of very large maps sometimes printed in several colours from separate zincs.

The maps existing early in 1915 were the Indian Degree sheets on the ¼-inch scale, and the War Office sheets compiled from various sources on nearly the same scale (1/250,000). These varied much locally in quality, and were particularly wanting in information in the Basrah operation area. Willcock's irrigation maps were of great use as a general guide to the main waterways and the principal places thereon, and particularly useful in obtaining approximate ground heights. These maps had been prepared essentially for irrigation purposes and were not topographical maps; they did not extend into the swamps, nor into areas where future irrigation projects would be impracticable, and they sometimes required local adjustment in azimuth. Near Baghdad and further north the detailed irrigation maps were found of great use as a temporary framework before the advent of triangulation.

A framework of theodolite triangulation was carried along the main rivers between measured bases. This triangulation was extended in a network over the central area, and by branch lines into the desert and Persian hills. Five-inch vernier or micrometer theodolites were used for the triangulation and Invar tapes for the bases. Altogether seventeen bases, varying in length from 1500 to 5000 feet, were measured at intervals along the rivers and at outlying places, and latitude and azimuth were observed at each base. The initial point was the position of Fau telegraph office, which had previously been connected by telegraph longitude observations with Reshire near Bushire. The longitudes of Baghdad and Kirmanshah were obtained by the simultaneous recording of wireless signals at Fau, Baghdad, and Kirmanshah, sent out from the main radio station. The wireless signals were the same as used by the Cav. De Filippi's Expedition to the Western Karakoram in 1913, as given in one of the Survey of India Record volumes, and were found very suitable. The radio signals were rather blurred and indistinct on the first night when recorded at Baghdad and Kirmanshah, but on the power being increased were very clear and sharp; and the arrangements made for sending out the signals by the Telegraph Department and for receiving the signals by the Anzac wireless staff at the three recording stations were very satisfactory. Three groups of thirty signals were sent each night on two nights, with one night interval; chronometer watches were

used at Baghdad and Kirmanshah, and a box chronometer at Fau. The times were estimated by eye, by means of reading glasses, to seconds and tenths, and the watch times were subsequently compared with local mean time by observations to east and west stars. It was impossible to interchange observers at the three stations, so the result is still burdened by the personal errors of the observers; otherwise the probable error of the result is 1 second of arc, or about 72 feet.

The character of the country varied greatly, but can be roughly divided into (1) swamps and date groves between Fau, Basrah, Amarah, and Kut along the Tigris and adjacent areas, and between Qurnah and Nasiriyah and up the Euphrates to Kufah and Diwaniyah; (2) irrigation area along the Tigris and Diyalah rivers above Kut, and the Euphrates River above Diwaniyah and Kufah; (3) the desert areas south of Basrah and Zubair as far as Kuwait, and between the Tigris and the Persian hills, with the great expanse of desert south of the Euphrates containing the sacred cities of Karbalah and Najaf; (4) the Persian foothills, including the Jabal Hamrin area north-east of Baghdad. The methods of work most suitable in the date groves and swamp areas consisted of theodolite triangulation, with sides of triangles of an average length of from one to three miles according to the density of the trees, and the width and sinuosity of the waterways. The inhabitants generally permitted station marks and artificial signals to remain in position for a few days only, so many natural large objects such as brick-kilns, minarets, and tombs (Imams) were intersected. High pivot flags, or unusually high or peculiar-shaped palms that could be identified from a distance above the palm groves, were extensively used as pivots, in pairs if possible, and the third angles of triangles deduced to enable awkward corners and difficult bends of rivers to be turned; but in the narrow densely wooded places and sharp bends, it was sometimes necessary to carry the triangulation temporarily into the adjoining desert and swamp areas, till more favourable river conditions could be found. In the swamp areas between Basrah, Amarah, and Nasiriyah, local sailing-boats and row-boats were used for the surveyors and escorts. The ideal would have been to survey the ground when the rivers were at their lowest, and again visit the ground during the inundation period and mark in the areas subject to inundation; but the surveys had to be carried out when actually required, and when the military and political conditions were favourable, so that frequently original surveys had to be carried out in areas completely or partly flooded, in which case the water-channels had to be located by sounding, and the depth of water and dates of measurement recorded and entered on the map. In order to obtain his position the surveyor lengthened the legs of his plane-table by bamboos from 10 to 15 feet in length, and was able to set it up in 10 feet of water between two ballams (Arab row-boats) and thus carry on his work.

In the irrigation area in the Baghdad Viliyat the numerous mounds

and old high-banked canals gave excellent sites for triangulation stations, and like the pagodas in Burma, the ancient mosques, minarets, and imams provided many suitable natural objects for theodolite intersection; but the network of canals and waterways, some of which were modern and others ancient or disused, necessitated special methods of survey on scales larger than the normal. The country was too flat to contour as a whole, so that the relative heights of mounds and banks above the normal surface of the ground, and the depth below ground of the bottoms of ditches and canals, with their width at ground level, were measured in feet and entered at suitable intervals on the maps as required.

In the desert areas along the southern bank of the Euphrates throughout the operation area the ground could be contoured, and 20-feet vertical interval was found suitable. The mirage interfered much with both triangulation and detail surveys, stopping it altogether in the middle of the day; and in summer it was possible to work only between the hours of five and nine in the morning, and four and seven in the evening. Owing to the mirage and unavoidable grazing rays in triangulation it was impossible to avoid large accumulated errors in the measurement of heights obtained by vertical angles. It was impossible to locate Willcocks's spot heights individually with any accuracy, but owing to the very gradual slope of the ground in Mesopotamia as a whole, their approximate positions could be utilized in order to reduce accumulated errors in triangulation heights, so that when available the position of three or four of Willcocks's ground heights were approximately located by comparing his charts with the ground, and the distance and vertical angles measured between each of these and a selected triangulation station; this enabled a satisfactory mean height to be obtained.

Whenever time admitted a framework of triangulation was always used in the desert areas, but sometimes it was only possible to run series of triangles into the desert at intervals, and fill up the areas between by graphic plane-table triangulation and detail survey. Measuring-wheel traverses were sometimes employed as a connecting link between different series of triangulation, but as seldom as possible and generally as a temporary measure for route surveys and special purposes.

It was necessary in waterless areas to lay in a stock of food, firewood, and fodder for the duration of particular work, and to convey these things from one camp to another. Whenever possible mechanical transport was used on the march, and to convey the survey establishment and their escorts when at work. This increased the radius of action, and rate of work sixteen times, and enabled the surveyors to camp at military posts outside the desert areas, and to go out with daily escorts which could be changed, or altered in composition or strength, as required. By far the most convenient and efficient form of mechanical transport for survey purposes was the small Ford van, with a hood in front, and low wooden sides. A few showers of rain did not interfere with mechanical transport in the

hard gravelly desert, nor prevent the surveyors returning to camp if it rained when they were out at work for the day; but on ground covered with alluvial silt, and elsewhere in Mesopotamia, any rain made work impossible except on foot, until the ground had had time to dry. A 1-ton Fiat lorry was used with success for route surveys south of Nasiriyah, and was kept on a magnetic bearing through the undulations of the desert by a liquid compass set up on the top of a plane-table stand in the back part of the van away from the magneto; the distances were measured by a surveyor's bicycle wheel with cyclometer, trailed behind the van. The van was got out of sand-drifts by placing planks of wood under the wheels. It was found hardly ever necessary to go down to first speed, but there was too great a difference between third and fourth speeds, as on local good hard ground 10 miles south of the Euphrates the fourth speed could not be used at all, and the engine raced on the third speed. Heavy 3-ton lorries were not used for survey purposes and would probably have been found unsuitable.

On the Jabal Hamrin area and adjacent Persian foothills it was generally necessary to get an approximately accurate map out in the shortest possible time and to improve it later as opportunities offered. The ground in the Jabal Hamrin area was very much broken and cut up by dry winding watercourses. In the time available a regular survey was impossible, so air-craft photography was used to assist the ground survey. It was only possible to fix prominent objects by triangulation, and for subsequent contouring to put in ground heights, and survey on the ground the main physical features, such as the junctions of main watercourses and of main ridges. It was also necessary to survey in detail such undulating ground as would probably not show up in relief in the air photographs. Great credit is due to the officers of the Royal Air Force in Mesopotamia for their untiring efforts in aircraft photography, and Lieut.-Colonel C. P. Gunter, R.E., O.C., Map Compilation Section, who subsequently dealt with these photographs. Major G. A. Beazeley, D.S.O., R.E., did much rapid survey work in the advanced area for particular purposes, and many approximate maps of inaccessible areas were compiled to satisfy temporary military needs, by means of aircraft photographs and sketches fitted on to an approximate framework of enlargements of existing maps, or to theodolite or plane-table points intersected from a distance. Good work was also done by Captain W. E. Perry, M.C., R.E., and Hon. Lieutenants Strong, Booth, and McCraken of the Survey of India in the forward areas and lines of communications. The information contained in the maps was obtained in the first instance by local inquiry through as many reliable sources as possible. In areas on and near the fronts, where the inhabitants were either hostile or absent, great difficulties were experienced in obtaining correct local names. In the absence of local names English descriptive names were used, which could be recognized by the General Staff and by the troops. These names answered temporary purposes and

were subsequently corrected when opportunities offered. The field maps and their name-lists were then sent to General Headquarters, and the tribal distribution and names again checked and retransliterated according to the system in use by the Field Force so as to secure uniformity of spelling.

There are many difficulties in Arabic names. Although the written language is the same, there are many local words in Mesopotamia, and the pronunciation is very different in different localities and among different Arab tribes. To any one without a general knowledge of oriental languages, and Arabic in particular, it was very difficult to recognize how a name should be written from the local pronunciation. If the inhabitants in the particular areas under survey were as a whole illiterate, correct names were sometimes obtained by sending with each surveyor a literate Arab solely for the purpose of writing down names after questioning the inhabitants. In nomadic areas along the Persian and Kurdish foothills different tribes occupied different areas at different times and had slightly different names for the same place or locality. There were Kurdish names in areas which were normally Persian, and Kurdish or Persian names in country which was usually considered Arabic speaking. The system in use in Mesopotamia at present for the transliteration of Arabic names differs from the system used for both Kurdish and Persian. In Arabic the letters *o* and *e* are not used in transliteration; yet some words crystallized by use, such as Tel (a mound), Khor (a maritime waterway or area), were retained; but the word Haur (an inland waterway or area), in which *au* has the sound of the letter *o*, was also in use.

Miss Gertrude Bell, C.B.E., supplied valuable information regarding the tribes and tribal distribution, and her thorough knowledge of the Arabic language and of Mesopotamia and adjacent countries was of the greatest use in the verification and transliteration of names.

Before any particular work was undertaken the political and military conditions in the area were considered, to settle the strength of survey establishments, and the form and strength of escorts and transport. As a general principle in the forward areas the local area commander was responsible for the strength and constitution of survey escorts. At certain times all available troops were required on the fighting fronts, and none whatever were available for survey escorts; normally, while active operations were in progress military escorts and mechanical transport (Ford vans) were available only for surveys of extreme importance and urgency on or near the fighting fronts. At such times it was necessary to employ all survey establishment not required in the advanced areas on more settled regions elsewhere. During the intervals between active operations, escorts and Ford vans could generally be provided, and survey parties were rapidly pushed forward to deal thoroughly with the advanced areas. As much work as possible was done with the concurrence of the local tribesmen, and without escorts, or with tribal guards and transport

supplied by the local shaikhs under political arrangements. This enabled local information to be more readily obtained and ensured economy in the use of military escorts and transport, which could ill be spared from their duties elsewhere.

The large amount of survey carried out since December 1914 could not have been done without the co-operation and great help given by the officers of the General Staff in Mesopotamia, and especially by the Intelligence and Political Departments, nor without the personal interest taken in the work by the late Army Commander, Lieut.-General Sir Stanley Maude, K.C.B., C.M.G., D.S.O.

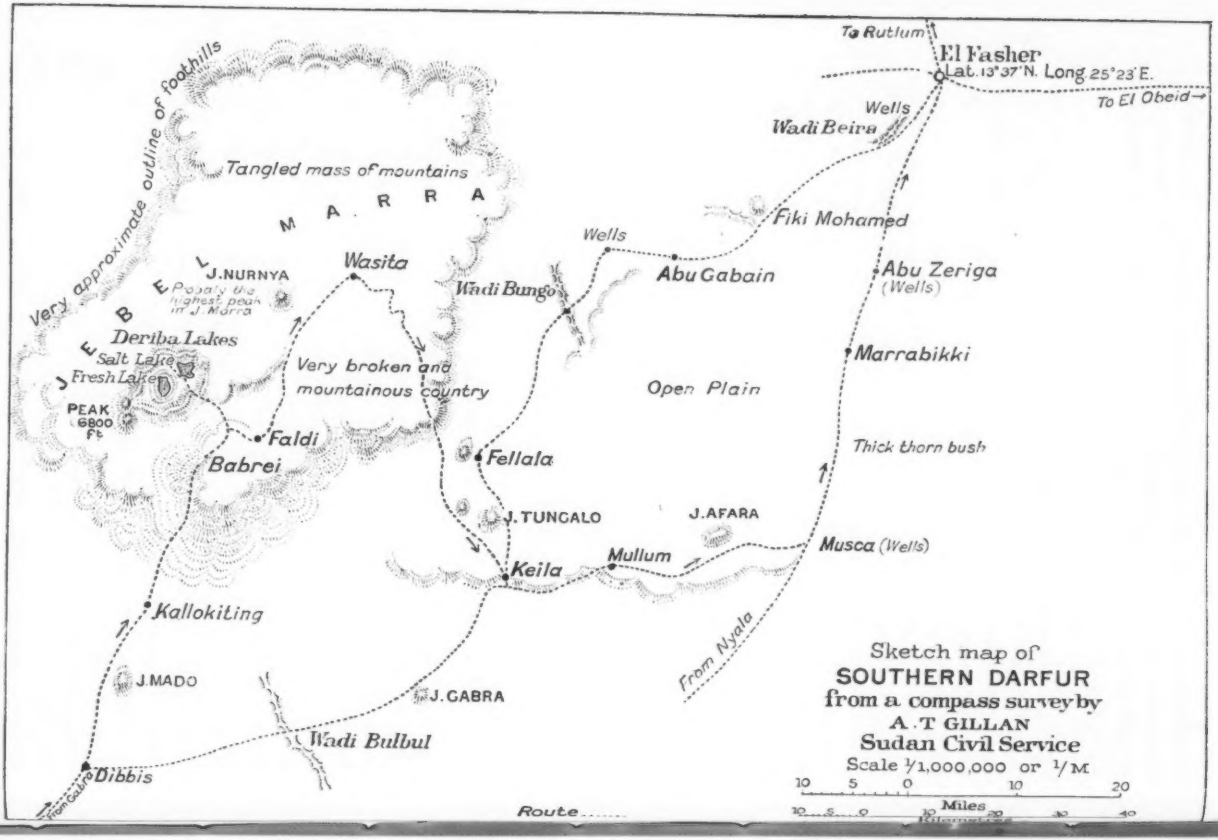
The difficulties experienced in carrying out surveys in Mesopotamia during the three and a quarter years they were under the direction of Colonel Pirrie were in the employment of officers and surveyors on particular work suitable to their individual qualifications and experience, and to anticipate correctly the probable course of events and to increase promptly the survey establishment by adequate and suitable reinforcements, and to carry out and complete in the time available sufficiently accurate surveys for particular purposes, and by irregular and rapid methods, if necessary, and at the same time to keep the work as a whole scientifically controlled and up to the high standard of the Survey of India.

NOTES ON JEBEL MARRA, DARFUR

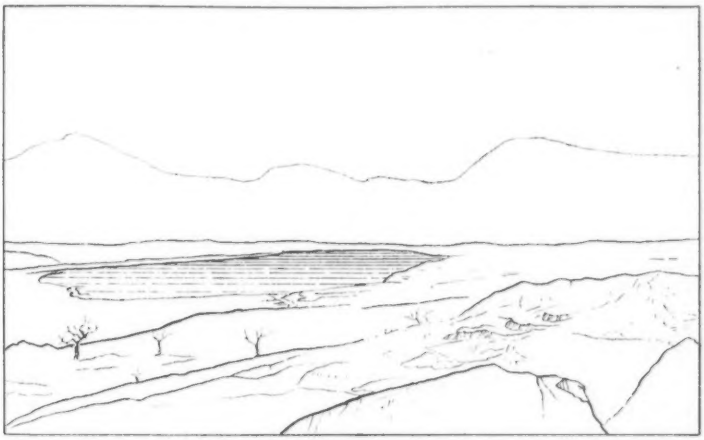
Captain H. F. C. Hobbs, The Prince of Wales' Own (West Yorkshire Regiment), attached Egyptian Army

JEBEL Marra, in Darfur, although marked on almost any small-scale map of Africa that one cares to examine, is a mountain—or, more correctly speaking, a tangled mass of mountains—about which little is known and of which none but very approximate and inaccurate small-scale maps exist. As far as I am aware, the south-westerly peak of the Jebel and the two small lakes which lie close to it, which I am about to describe, have never before been visited by a European; although the lakes were evidently known by repute, since they appear as "See Daribe" on Nachtigal's map (Justus Perthes, 1875). I believe that Zubeir Pasha, sometime in the seventies, paid a visit to these lakes, but the local natives say that he never climbed the peak.

Our duties on a patrol in Southern Darfur, in March 1918, gave Mr. J. A. Gillan, of the Sudan Civil Service, and myself an opportunity of making a very brief exploration of the above places. Our starting-point was from the Fur village of Kallokiting, which lies at the base of the south-westerly foothills of the mountain, about 90 miles south-west of El Fasher. The lakes and peak lie, as the crow flies, some 20 miles N.N.W.


To Rutlum
El Fasher
Lat. 13°37'N. Long 25°23'E.
To El Obeid
Wells
Wadi Beira
Tangled mass of mountains
M A R R A
Very approximate outline of foothills
Fiki Mohamed
Wells
Abu Gabain
Abu Zeriga
(Wells)
J. NURNYA
Probably the highest peak in J. Marra
Wasita
Wadi Bungo
Deriba Lakes
Salt Lake
Fresh Lake
Very broken and mountainous country
Open Plain
Marrabikki
PEAK 6800 Ft
Faldi
Babrei
Fellala
Thick thorn bush
J. TUNGALO
J. AFARA
Musca (Wells)
Mullum
Keila
Kallokiting
J. MADO
J. GABRA
Wadi Bulbul
From Nyala
Dibbis
From Cairo
Route
Sketch map of
SOUTHERN DARFUR
from a compass survey by
A. T GILLAN
Sudan Civil Service
Scale 1/1,000,000 or 1/M
10 5 0 10 20
Miles

of this village, the route on foot to the former being nearly 30 miles, and to the latter, by the track we followed, about 40 miles. Leaving Kallo-kiting early on March 11 we camped the same night at an altitude of 2000 feet above the plain, reaching the lakes at Deriba the following morning. The going throughout was very broken and difficult, and in places a false step would have meant a fall of several hundreds of feet. There appeared to be few obstacles, however, which could not be successfully negotiated by our transport donkeys; the way in which these animals—born and bred on the mountain-sides—carried our loads over the seemingly most impossible obstructions was truly extraordinary. The lower slopes of the mountain are very rugged and barren in this locality, although the sides of almost every spur and re-entrant had long since been terraced for cultivation purposes, the result of years of labour, and

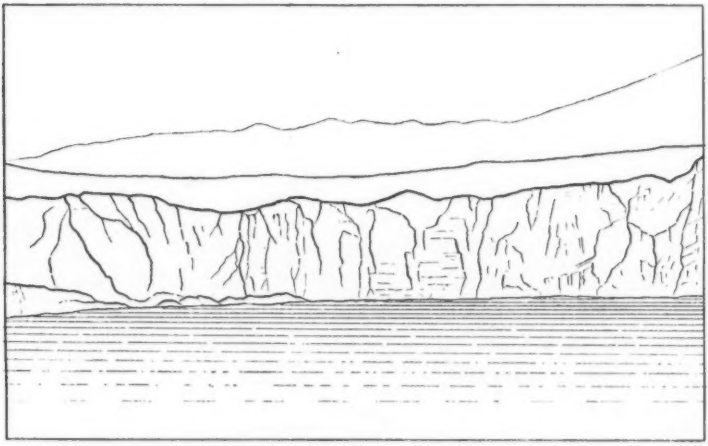


THE SALT LAKE LOOKING NORTH-WEST
(*Drawn from photograph by the Author.*)

indicative of a very numerous and, it would appear, industrious population in former times. It was not until we had risen some 1700 feet above the plain that we encountered any signs of present-day occupation: here the nature of the country changes, numerous rock-plants, bracken, and short grass making their appearance with villages, areas of wheat cultivation, and tomato and onion patches; the latter being irrigated by means of the many small running streams with which the Jebel abounds.

The two lakes at Deriba (as far as I am aware, the only two in Jebel Marra) lie, at an altitude of 1700 feet above the plain and 4804 feet above sea-level, in the arena of what may best be described as a vast amphitheatre, from 3 to 4 miles in diameter, formed by a continuous circular (or slightly oval) range of steeply sloping heights, varying from about 800 to 2000 feet above the surface of the lakes.

The salt lake (termed by the natives the "female"), which is the larger of the two, occupies the north-east corner of this amphitheatre. It measures approximately 1950 yards in length, 1350 in breadth and about $3\frac{1}{4}$ miles in circumference. The water is very salt, dirty, greenish in colour and has an unpleasant, acrid smell. There is a very heavy deposit of salt all round the perimeter of the lake, clearly defining its high-water mark. Except at the northern end the banks shelve very gradually into soft, oozing, strongly smelling mud. I had no time to take soundings; but from the gently sloping nature of the banks and the ground in their immediate vicinity, it would appear that the lake is of no great depth, except, possibly, at its extreme northerly end. I made a complete prismatic compass traverse of this lake, pacing the distances. My closing error being small, I think the results are fairly accurate.



THE CRATER LAKE LOOKING DUE WEST
(*Drawn from photograph by the Author.*)

The second lake (the "male") lies about $\frac{3}{4}$ mile to the south-west of the salt lake and contains more or less fresh water. It is approximately 1550 yards long, 900 broad, with a circumference of about 2 miles. It forms the centre of a large crater, undoubtedly volcanic in origin, the sides of which rise almost perpendicularly out of the water to heights varying from about 400 to 700 feet, except on the northern side, where the lip of the crater is considerably lower than on the other sides, and where the slope to the water is more gradual. The water, like that of the salt lake, is greenish in colour, but clean and clear, and smells and tastes slightly of sulphur. Mr. Gillan obtained a bottleful of this water with the intention of sending it to Khartoum for analysis, but it was unfortunately broken, incidentally with our last bottle of whiskey, next day. The banks shelve very abruptly and the lake appears to be of great depth.

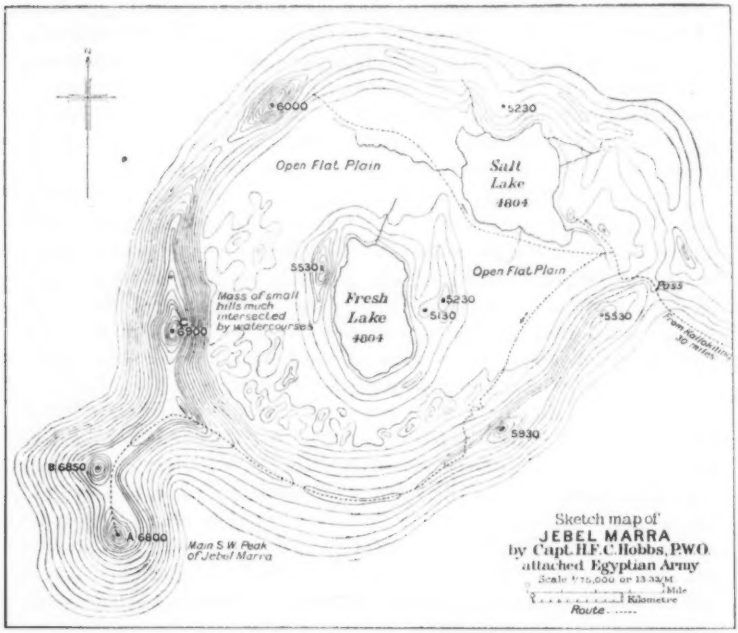
I had no time to take soundings or to make a complete traverse of this lake, and had to rely on a prismatic compass and a pocket range-finder for most of my distances; the figures given above must therefore be considered as only approximate.

The lake is regarded with much superstition and fear by the inhabitants of Jebel Marra, to whom its mystic properties are well known, though extraordinarily few natives appear to have actually visited it. The Furs of the Jebel say it is haunted, regard it as an oracle, and ask it questions, the answers to which they deduce from the various colours which the waters of the lake assume in the early morning or late afternoon, when there is considerable reflection, or when the surface of the water is ruffled by the wind. When Ali Dinar, the late Sultan of Darfur, was fleeing in front of the force under Major (now Brigadier-General) H. J. Huddleston, D.S.O., in October 1916, he sent two of his followers to this lake to consult the waters on his future movements. The natives say the "waters refused" to let the envoys approach, and even retired before them, which probably means that the latter became panic stricken and were too terrified to go near the water. Whatever happened did not do Ali Dinar much good, as he was killed and the whole of his forces taken prisoners a few weeks later. Mr. Gillan and myself and several of the native soldiers and police who had accompanied us on this trip bathed in the lake, in view of some of the Jebel sheikhs, who were much impressed when they saw us all emerge safely from the water, unharmed by the demons of the lake. Nothing would induce any of them to bathe, though a few of the more venturesome timidly washed their faces and hands.

There is no outlet of any kind from either of these lakes, unless it be subterranean. They are fed by numerous khors from the surrounding mountains, only one of which was running on the date of our visit (13 March 1918). It is worth noting that there appears to be very little rise or fall of water in either of the lakes. As I have mentioned, the high-water mark of the salt lake was very clearly defined and was certainly not more than 2 feet above the level of the water as we saw it. This is rather remarkable, as an enormous quantity of water must come down from the encircling mountains in the rainy season.

We made the ascent of the main south-westerly peak (marked A on sketch-map) on March 13. The previous evening we assembled the majority of the natives who had accompanied us from Kallokiting, together with several who lived near the lakes, with a view to obtaining guides to show us the best way up the mountain. Trusting, no doubt, that by feigning ignorance of the way they might deter the incomprehensible white men from attempting not only an unnecessary but a distinctly fatiguing expedition, the natives, one and all, said there was no path and that if there was *they* did not know it. We replied that we did not want a path and that we would find a way up, and added that, in order to give them an opportunity of learning a little of the geography of their

own mountain, they had all better accompany us next day. When we set out next morning, however, several guides were forthcoming, who led us at once on to a well-worn track which took us over the worst part of our climb. From the lake-level the ascent occupied $4\frac{3}{4}$ hours, the climb up the face of the heights encircling the lakes being almost precipitous. Having gained the crest of these heights, we found that our best way was to move along it, which we did, and reached our objective without difficulty. Having reached the summit, where a cairn was built, we found that there were two other peaks, about $\frac{1}{2}$ mile and 4 miles distant respectively (marked B and C on sketch-map), which were higher by 50 or 100



feet than the one (A) we were on; and a third, about 20 miles distant, bearing 54° magnetic, which was probably highest of all. The peak we climbed is by far the most conspicuous in the south-westerly end of the mountain, and is called by the people the "original" Jebel Marra.

Owing to the fact that my aneroid barometer was constructed to register only up to 5000 feet, I was unable to ascertain the height of the peak we climbed. The lakes registered 4804 feet above sea-level, and I should say, estimating by eye, that the peak was at least 2000 feet above them, which would make it about 6800 feet above sea-level.

We came across many traces of greater kudu on our way up the mountain, and saw two females about 600 yards off. These, and a soli-

tary couple of golden-crested cranes on the haunted lake, were the only game we saw in the Jebel. From the peak we returned to camp at Deriba, the return journey occupying 3½ hours.

On March 15 we left Deriba, and, retracing for a few miles our path from Kallokiting, struck north-east across the mountain and eventually reached the plain near Kala village on the evening of the 20th. Our route from south to north-east ran over very broken and rough country, switchbacking over rocky gorges and intervening ridges. We passed many villages, considerable cultivation, and endless terracing.

The Fur build quite good tukls or circular huts with walls of loose stones and roofs well thatched with grass. The villages are in every case surrounded by loose stone walls of considerable strength and thickness, about 6 feet high, and usually topped with a breastwork of faggots. These villages are very much better and more strongly built than any others I have yet seen in northern or southern Darfur, and are in striking contrast to the miserable, ill-built hovels of the Beni Helba Baggara Arabs who inhabit the plain to the south-west of the Jebel.

The Jebel Fur are a shy, fatalistic, and credulous people of low mental development. On the other hand, they are distinctly in advance of the other tribes of Darfur as builders and cultivators, and with firm and sympathetic handling should in time develop their natural talents to a considerable extent.

I am indebted to Mr. J. A. Gillan for the small-scale sketch-map which illustrates the relative positions of the Deriba lakes and El Fasher; and to Mr. H. A. MacMichael, D.S.O., Sudan Civil Service, for reference to old maps of Jebel Marra in his possession.

El Fasher, 14 April 1918.

THE GEOLOGICAL APPLICATION OF GEODETIC RESULTS

R. D. Oldham, F.R.S.

SOME criticism is so wide of the mark that it hardly calls for reply, and to this class Sir S. Burrard's note in the October number of this *Journal* seems to me to belong. He starts by describing my memoir as a book on geodesy written by a professional geologist; this, however, is just what it is not, nor was meant to be, on the contrary it accepts the results of geodetic work absolutely, and is an attempt to examine how far, and in what way, these results may be used in elucidating a certain limited group of purely geological problems. This distinction was set forth as clearly as possible, not without success if one may judge from the summary of the literature by Dr. Morley Davies, published in this *Journal*, and the review which appeared in *Nature*. Neither of these

writers, approaching the subject impartially and without prepossessed notions, took the memoir for a contribution to geodesy; both of them, independently, recognized it for what it was intended to be. Having started with a wrong impression, Sir Sidney Burrard proceeds to a series of criticisms in all of which he has mistaken the question at issue, and his comments might have been left unanswered were it not that many will see his note who may never have the opportunity or the time to study the memoir itself. For this reason it may be well to give a brief account of what it really is.

The memoir starts with a statement of the geological problems which are not yet fully solved and in regard to which it seemed likely that geodetic observations might help. This, like the rest of the memoir, is addressed only to practised geologists, to whom it should be sufficient and intelligible; to the uninitiated in geology no appeal was made. Next the nature of the geodetic data is discussed with the purpose of establishing how far and in what way they may be applied to the elucidation of the geological problems. Then comes the actual application and finally a discussion, incidental though inevitable, of theories of the origin of mountain ranges. In all this only one object was held in view, the geological; the work is addressed only to geologists, and only to the limited section of those who have specialized on the physical side of the science. That Sir S. Burrard should find it difficult to understand is not to be wondered at, for it was not intended to be easy reading even for the restricted audience to which it was addressed, but it is certainly surprising that he should have misunderstood it so far as to regard it as intended to be a contribution to geodesy. Throughout the whole book there is no suggestion of this, no proposal to modify in any way the methods which geodesists have found most suitable to their special needs, and most certainly neither suggestion, nor wish, to lower the standard of geodetic accuracy.

This last word is often used in an inaccurate manner, as synonymous with numerical precision, and it is in this sense that Sir S. Burrard uses it in dealing with the supposed want of accuracy of the methods used by me, yet the two are by no means the same. The engineer does not estimate the weight of a locomotive in milligrammes nor the chemist conduct his analyses in tons, yet accuracy is as imperative and as strictly sought after in the one case as the other. Nor is it usual to employ a micrometer where a measurement to the nearest inch, or sixteenth of an inch, is sufficient, and a foot rule supplies the need in a quicker and more convenient way; but the maker of foot rules must have in his factory some much more precise means of measurement, or else his product will deteriorate in accuracy. This presents a very close analogy with the position in which I found myself. Had detailed calculations of all the corrections been made and published for every station the less precise methods would have been unnecessary; but this information was not available, and to

complete it in the manner needed in geodesy would only be possible for one who had the resources of an organized computing office at his disposal, and would then have taken a long time to complete. In these circumstances it seemed justifiable to construct a foot rule, based on the micrometer measurements of geodetic methods, and to adopt simpler methods of computation, which certainly reduced the time taken a hundredfold or more, while giving results of sufficient precision for the purpose in view; but it is throughout clearly specified that they are justifiable only for that purpose, and within the limits of their actual application, and no suggestion is made that they should be adopted for any other. The matter may be very simply put in a precise numerical form. The geodetic results are published by the Trigonometrical Survey to one-hundredth part of a second of arc, in the case of deflection of the plumb-line, and to the thousandth part of one dyne per gramme of mass in the case of the force of gravity. When I came to look into the question of the application of these results to geology I found that it was useless to consider differences of less than a whole second of arc in the one case, and the hundredth part of a dyne in the other, and very little use in dealing with differences of less than double these amounts. The necessary degree of precision, therefore, is about twenty times less in the latter case, and two hundred times less in the former, and I believe that the methods adopted by me are of sufficient accuracy to give this degree of precision, when it is borne in mind that groups and averages are being dealt with, not isolated observations. If it can be shown that the methods will not give this degree of accuracy, the criticism would conduce to the advancement of knowledge; but this is not helped forward by cavilling because no attempt was made to maintain a wholly unnecessary degree of precision.

In connection with this question of accuracy of computation, I must point out that Sir S. Burrard does not maintain, in his paper, the high standard he demands of others and himself has shown in his own geodetic work. His method of obtaining an average is at least unusual; traversing my estimate of the mean density of the Siwalik and alluvial deposits, he selects some of the denser elements of the former, ranging from 2·35 to 2·60—he might have quoted some elements of even greater density—and derives from them a mean density of 2·4, altogether ignoring the fact that the elements referred to by him, though the most conspicuous, are a subsiding element of the Siwalik series, of which quite one half consists of clays and soft sandstones having a density of little over 2·0. He has also forgotten that in a previous publication he had deliberately adopted the figure of 2·0 for the mean density of the alluvium to a depth of 2000 feet,* and in another had accepted 2·2 as the mean density of the Siwaliks.†

* "Attraction of the Himalaya Mountains upon the Plumb-line in India." Survey of India, Professional paper, No. 5 (Dehra Dun, 1901), p. 84.

† "On the Origin of the Himalaya Mountains." Ibid., No. 12 (Calcutta, 1912), p. 4.

The former of these is a close approximation to the reality, as close as it is possible to come; the latter is probably about right, possibly a little low, for the mean density expressed to one place of decimals would be between 2·2 and 2·3. My own estimate, deliberately arrived at, was that the bulk average density of the Siwaliks and alluvium taken together was close on 2·2 provided that the maximum thickness did not exceed 20,000 feet, and a value of 2·16 was adopted as a very close approximation to this, which very largely reduced the labour of computation. There is, however, this much point in Sir S. Burrard's comments, that a density somewhat greater than the mean should have been used in discussing the geodetic observation in the Dehra Dun district; on the other hand, a somewhat lesser density should have been used over the southern half of the alluvial trough. Had this been done, there would in both cases have been a somewhat closer agreement between the results obtained by the Geological and the Trigonometrical Surveys of India; it was not done because in neither case is any precise numerical estimate possible, and it was sufficient to show that the two were compatible with each other.

Having formed his own estimate of the density of the alluvium, Sir S. Burrard proceeds to deduce from it certain figures given in the last column of the table on p. 242, and with regard to these figures it must be observed that they need to be reduced by 10 per cent. to bring them into accord with those in the preceding column and the two column headings, on which they are based. The matter is a very simple one: a density of 2·16 as compared with 2·7, the average density of surface rock as used by me, represents a deficiency of 0·54, a density of 2·4 shows a deficiency of 0·30; the ratio of these two deficiencies is not 1 : 2·0, but 1 : 1·8, or exactly 10 per cent. less on the result than the figures given. Even if a mean density of 2·67, as quoted by Sir S. Burrard, is used, the figures are still more than 5 per cent. too large. I shall not pursue this matter further, but it may be remarked that, when rebuking another for want of accuracy, it would have been well to make sure of his own arithmetic, otherwise "an uninitiated reader will never realize" that an error of 10, or even 5, per cent. in the final result is not the degree of inaccuracy regarded as admissible in geodetic work.

The geological problems dealt with in the memoir are all of a character which permits them to be properly appreciated only by practised, but not necessarily professional, geologists, and, having little or no geographical application, are unsuited for discussion in this *Journal*. They are all difficult, and some extremely recondite, and are almost certain to be misunderstood by those who are not familiar with the language of geology, for this, no less than other subjects, including geodesy, makes use of words in a special sense and a different connotation from that which they would have in a different context. Of this Sir S. Burrard's article is an example, for in his treatment of the geological problems he has throughout misapprehended the point at issue, and his criticisms are as ungrounded as

his discovery that a paper by me, published in the *Journal* of September 1917, was written to justify an expression in the Memoir. A book takes longer to put through the press than a paper in a periodical, especially when author and printer are at opposite sides of the world; and in fact the whole of the Memoir was written and corrected in proof—the only alteration other than verbal being the addition of two footnotes—before the paper in this *Journal* was even contemplated.

TRANSLATIONS FROM THE CHINESE WORLD MAP OF FATHER RICCI

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IN order to save space, I will assume that readers of the *Geographical Journal* are acquainted with the main facts relating to Ricci's series of World Maps, as set forth in the most instructive articles by Messrs. Baddeley and Heawood which appeared in the October number of 1917. The present article is an attempt to supplement those data (gathered from Ricci's 'Commentarj' and other European sources) by a survey of the actual contents of the R.G.S. map itself. A full critical examination is hardly possible without the use of Chinese characters; but I hope by a translation of some of the legends and place-names to throw a little further light on the questions discussed by the previous writers, more especially (1) the date of the R.G.S. copy, and (2) its relation to the Ambrosiana Map and the European maps of the world existing at that period.

The inscriptions on the map may be conveniently grouped under four separate heads: (1) a number of what, for want of a better term, may be called "prefaces." One of these is from the pen of Ricci himself; the others are complimentary notices or short explanatory essays written by Chinese friends;* (2) discourses on the elements of astronomy, cosmography, and kindred subjects; (3) place-names; (4) notes on the products of various countries, the manners and customs of the inhabitants, etc.

Ricci's preface will be found just south of the Tropic of Capricorn, and west of the central meridian. The beginning has been so badly rubbed as to render a connected translation impossible, but fortunately this portion seems to contain only general observations of little interest. Omitting the first five columns, then, we come at once to his account of the genesis of the World Map:

. . . Filled with admiration for the great Chinese Empire, whose fame extended over ten thousand *li*, I came from the West on a floating raft, and

* Cf. 'Commentarj,' p. 394: "Et il Lingozuon . . . hebbe di altri letterati molti prohemij che danno autorità all' opera e dipoi di sculpito in tavole." Trigault ('De Christiana Expeditione,' edn. of 1616, p. 425) says: "Huic operi varia Literatorum poëmata splendorem addiderunt," "poëmata" being probably a slip for "procemia."

in the year *jên-wu* (1582) . . .* Certain scholars of Kwangtung requested me to make a map of the various countries I had passed through, so that the memory of my journey might endure. At that time I was not yet thoroughly conversant with the Chinese language; nevertheless, I made a series of selections from the maps and books which I had brought with me, as well as from the notes and diaries of several years, and had them engraved on blocks. The translation, however, made by an official interpreter† could not in the nature of things be free from mistakes; so in *kêng-tzŭ* (1600),‡ when I went to Nanking and received the instructions of Mr. Wu Tso-hai,§ I prepared a second edition of the map for him.

In *hsin-ch'ou* (1601)‖ I came to Peking, where several gentlemen saw this map and were much impressed by it. They persuaded me to stay in the capital and treated me with friendly hospitality far above my deserts. Mr. Li Wo-ts'un,¶ President of the Board of Repairs,** had long been devoted to the study of geography, and had compiled a book on the subject for the use of students.†† He was deeply interested in this map, and was convinced that the correspondence between the celestial circles and the terrestrial degrees of latitude and longitude was based on an immutable law. As the result of most painstaking calculations which absorbed him uninterruptedly for a whole year, he was fain to acknowledge the narrow scope of his own previous map, which did not cover a tenth part of the globe as shown in the maps brought from the west; and he suggested a new edition of my work on a larger scale. I replied:

* One or two characters are illegible here, but 1582 clearly refers to the date of his arrival in China.

† *Ssŭ-pin* means literally "an official in charge of strangers," and we know that there was such an official at the capital under the T'ang dynasty. That Ricci had the help of a native interpreter appears from Trigault's account: "Gubernator igitur ipse P. Matthaeo Riccio auctor fuit, ut eam tabulam Sinicè loquentem faceret, auxilio Interpretis adhibito." Later on, at Peking, he speaks of an "advenarum praefectus," which is an exact translation of *ssŭ-pin*.

‡ *Kêng-tzŭ* was the year extending from 14 February 1600 to 2 February 1601. According to Mr. Baddeley, Ricci reached Nanking in February 1599. However that may be, the present text certainly indicates that the second edition of the map appeared in 1600, and not, as Father Tacchi Venturi assumes, in the preceding year.

§ Here we have the characters for the name "Uzohai," as it is spelt in Trigault and Ricci's own Commentaries. As we shall see, Wu's *ming* or personal name was Chung-ming; Tso-hai was only his *hao* (sobriquet or "appellation").

‖ Trigault gives the date of Ricci's entry into Peking as 24 January 1601, which in Chinese would be the 21st day of the 12th moon of *kêng-tzŭ*. But *hsin-ch'ou* here is doubtless taken as roughly corresponding to 1601.

¶ This is the official of whom we hear so much from the Jesuits under the appellation Lingozuon (also spelt by Trigault Ligotsun, Ligotsum, Ligotzum, and less correctly Ligozo and Lingosòn). "Wo-ts'un," like "Tso-hai," is a *hao*. His personal name was Chih-tsao, and his literary style Chên-chih. Li Chih-tsao is known as the part author of two treatises on plane geometry and arithmetic (to be found in the British Museum library), but no one seems to have realized his identity with "Lingozuon." In the Ming History there are biographical notices of no fewer than 415 men with the surname Li, but Ricci's friend is not among them.

** Cf. 'Commentarj,' p. 394: "questo . . . aveva un' offitio grande nel Tribunale delle Fabbriche;" Trigault, p. 425: "in operum publicorum tribunali graui munere fungebatur."

†† Cf. Trigault, *ibid.*: "Lingosòn . . . annis iuvenilibus superiorem ausus fuerat totius regni Sinensis descriptionem & quindecim provinciarum tabulas exactè sanè in lucem edere."

"For so many countries to become known by your means throughout China would be their good fortune. How can I refuse, then, to undertake a new and careful revision?" Thereupon, with the aid of the original maps brought from my humble country,* as well as of many Chinese topographical works, I prepared a new edition, correcting the errors in the old translation and in the numbers of the degrees, and also adding the names of many hundred new kingdoms; and wherever a space happened to be left vacant on the paper, I inserted notes on the customs and products of the various countries.

Although absolute completeness could not be achieved, yet it was a great improvement upon the previous map. Now, the real shape of the earth is spherical, whereas in the present map it is a flat surface, so that the truth of the matter is not easily comprehended at a glance. Therefore, again following the plan adopted in my own country, I also drew two hemispheres, one showing all that lies north of the equator, and the other all that lies south of it, the two poles falling exactly in the centre of the hemispheres, so as to give some idea of the real shape of the earth.†

For the greater convenience of the spectator, I made the map in the form of a large screen with six leaves,‡ thus enabling him to travel about, as it

* A good deal depends on the interpretation of this passage. Translated word for word, the Chinese is: "Then take humble district original map (or maps)," etc. The word translated "district" seems to be used vaguely for Europe as a whole; but even if it were restricted to Italy, there is no reason for thinking that Ricci is alluding to maps actually printed in that country.

† Mr. Heawood tells me that Plancius's map is the only one of this period he knows of that gives *insets* of complete north and south hemispheres, though *separate* maps of such occur in De Jode's Atlas of 1593, and even as early as 1510, or thereabouts, in a MS. treatise by Glareanus which was exhibited at the Royal Geographical Society in 1903. (See *Geographical Journal* for June 1905.)

‡ That the third edition of Ricci's Map was intended to serve as a folding screen appears from passages both in the 'Commentarj' and in Trigault, which seem to have been misunderstood by Mr. Baddeley. Ricci says (p. 394): "La prima cosa che fece fu ristampare il mappamondo assai più grande degli altri, in sei quadri più alti della statura di un huomo, che si piegano con sue aselle al modo della Cina molto galanti." (The first thing he did was to reprint the World-map, on a considerably larger scale than that of the previous editions, in six rectangular panels, taller than the stature of a man, which fold up by means of loop-hinges (?) after the elegant Chinese fashion.) Again (p. 577): ". . . Sei tavole, ciascheduna di un braccio di largo e due o più in lungo, che, stampati in esse, si incollavano in altre come impannate attaccate insieme con aseglie, per potersi raccogliere e stendere nelle sale con molta leggiadria." (Six sheets [made of silk], each a cubit in width and two or more in length, which, when the map had been printed on them, were pasted on to other sheets, as paper windows are, and fastened together by means of loops, so that they could be folded up or opened out in rooms without any difficulty.) What tends to make this passage obscure is, firstly, the doubtful meaning of "aseglie," and secondly, Ricci's omitting to tell us that the sheets were fixed to wooden frames before being fastened together. This can be gathered, though not perhaps very clearly, from Trigault, p. 209, where he speaks of the presents sent to the Pope: "In his erat descriptio Geographica totius Sinarũ Imperij in peculiari huius Orientis tabula depicta. Nam elegantem in modum valuas plicatiles componunt, ita ut aliam alia complectatur, quae deinde explicatae aulam universam occupant, & nullius adminiculo stantes oculis blandiuntur. Id gentis vocabulo *Guei-pim* appellatur." (Among these was included a map of the Chinese Empire depicted on a kind of table peculiar to this part of the Orient. Folding panels are elegantly joined together in such a way that they can close on one another, and when opened out stretch right across a room, standing without any other support and offering a pleasing object to the

were, while reclining at ease in his own study. Lo! to be able to scan all the countries of the world in turn without going out of doors must mean some small addition to one's faculties of sight and hearing.

I have heard it said that the great book of the universe can only be read by the higher type of man; and thus, he attains to the perfect Way. For, knowing heaven and earth, he can testify to the supreme goodness, greatness and unity of Him who controls heaven and earth. It is the uninstructed who reject God; and the learning that does not revert to the Sovereign Deity as its source is not really learning at all. Virtue consists in abolishing the germs of evil and in making perfection one's goal. He who, while slow to take heed of small things, is quick to appreciate what is great, who diminishes the sum of his petty anxieties in order to revert to the Supreme Unity, is surely not far from true wisdom. I, a man of no cleverness, in translating this world-map, do not presume to assert that I am helping men to acquire the knowledge born of experience; this can only be achieved by individual effort. But I look with hope and expectation to those who, like myself, are sojourners on this earth beneath the canopy of heaven.*

Respectfully indited by Matteo Ricci, a native of Europe, on a lucky day of the first month of autumn of the year *jén-yín* (1602) in the reign of Wan-li.†

The next preface that claims attention will be found some 30 degrees west of Cape Horn. The author is Ricci's friend "Uzohai," and it is referred to in the 'Commentarj' (p. 317) as "un proemio assai elegante e dotto." It was first printed in the Nanking edition of 1600.

Tsou Tzŭ declared that outside the Middle Kingdom there are eight other kingdoms similar to it, and that these nine kingdoms are encircled by a narrow sea.‡ But his theory is extravagant and nonsensical. According to tradition,

eye. This is called in native parlance a *Guei-pim*.) On p. 425, describing the third edition of the World-map, he adds the information that it was "neatly mounted on a number of swinging panels made of wood" (valuis quibusdam ligneis affabrè concinnatam). *Guei-pim* is in the modern transliteration *wei-ping*, the usual term for a folding screen. Mr. Baddeley was evidently thinking of a map on rollers, for he translates: "fastened together along the edges with ribbons so that they could be rolled up or spread out in rooms." As for "aselle," or "aseglie," it is a word borrowed from the Portuguese "azelha," a loop or handle. This is the diminutive of "aza," one meaning of which is stated in Figueiredo's dictionary to be "a piece of metal attached to wind-screens, where it serves the purpose of a latch (*puxador*)." In the present passage, however, it is probably not a metal hinge or latch, but a connecting loop in the form of a silken band.

* Trigault (p. 179) tells us that Ricci "inserted in convenient places on his map the sacred truths of our most holy religion." This, however, is the only passage in which I can find any trace of Christian propaganda.

† It is interesting to observe that Ricci does not scruple to follow the Chinese practice, derived perhaps from Taoism, of inditing on a "lucky day." The month corresponds to 17 Aug.—16 Sept. 1602; but, as in the case of printed books, the date of the preface cannot be taken as sure evidence of the date of publication. Further on we shall see that the present copy of the World-map must have been printed at a considerably later date than 1602.

‡ A full account of Tsou Tzŭ and his cosmographical theory is given in Ssŭ-ma Ch'ien's *Shih Chi*, chap. 74. Tsou Yen was a native of the Ch'i State who lived about 300 B.C., being a younger contemporary of Mencius. According to him, the so-called Middle Kingdom formed only one out of eighty-one equal parts into which the

the south-eastern branch of the K'un-lun range runs into China, and that is why all the rivers flow to the east. But the north-western branch must still constitute the other half of these mountains, and no one can clearly determine its limits. Now the earth is wide and great; but having a form it must be limited in size, and looked at from the standpoint of China, it does not stretch beyond the sea in the south-east, the K'un-lun in the west, and the Gobi desert in the north. Is it not a hard task to define the boundaries of the world? Restricted to what one sees, it might be considered small; stretching away beyond the reach of vision, it might be thought large. But notions of this kind are all misleading.

Li the philosopher* has come to China from Europe, and published a complete map of the world which has been much spoken of amongst the literati. I have ascertained that the maps which he makes are all based on originals printed in his own country. For the natives of his country and those of *Fu-lang-chi* (Portugal)† are fond of travelling to great distances, and when they pass through remote regions, they make a report of them which is duly noted down. Gradually accumulating information in this way, they have gained some idea of the shape of the whole earth; only the south polar zone has never yet been reached by any man.

If we wish to perfect our knowledge, we must pursue a system like this. Our philosopher is certainly no devotee of the black art or superstitious practices;‡ he worships God morning and evening, and has sworn never to be false in thought, deed, or word. With regard to his mathematical demonstration of the nature of the heavens and the remoteness of the sun, moon, and stars, although it is not easy to follow, yet there seems to be evidence for his statements, and they should be recorded until fuller knowledge is available.

Written by Wu Chung-ming, a native of Hsi (Hweichow in the modern Anhwei).

The long inscription in the middle of the Pacific, between the Tropic of Cancer and the Equator, is by Li Chih-tsao, who begins by giving a general explanation of Ricci's system and comparing it with the results attained by Chinese geographers, especially under the Yüan dynasty. He continues—

Hsi T'ai Tzŭ§ himself on his sea voyage crossed the Equator, where the two celestial poles, north and south, were on a level with his line of sight.

world was divided. There were nine provinces in China, and China itself belonged to a group of nine kingdoms, which were enclosed by a strip of sea. This group, again, was one of nine similar groups, and the whole was encircled by a vast ocean, the boundary between heaven and earth.

* "Li" represents the first syllable of Ricci, and *Shan-jên* (mountain man or recluse) is a title often bestowed on thinkers, whether living in seclusion or not.

† Fu-lang-chi, originally the Chinese rendering of "Franks," was applied to Europeans in general, but more especially to the Portuguese in the sixteenth and seventeenth centuries.

‡ This is put in because the Jesuit Fathers were popularly supposed to be magicians in possession of the secrets of alchemy; on more than one occasion they were involved in serious trouble on this account. See especially Trigault, p. 200.

§ An honorific title bestowed on Ricci meaning "The Eminent Philosopher of the West."

Proceeding still further south, he came to *Ta-lang Shan* (the Cape of Good Hope), and saw the southern pole high above the horizon. This was on the 36th parallel of latitude. . . .

This map was reprinted for him by a number of gentlemen at Nanking, but . . .* Accordingly, in conjunction with my friends, I had a screen made in six leaves . . . enlarging it to four times the size of the old production ;† and yet many names of countries are still omitted which in times past have brought tribute to China.

Li Chih-tsao concludes by discussing further details in the arrangement of the map.

The three remaining prefaces may be dismissed quite briefly. They are couched in the ultra-elegant and allusive style affected by Chinese literati in this species of composition.

Ch'i Kuang-tsung tells us that his friend Li Chih-tsao was on intimate terms with Ricci, whose work he admired greatly, and that he caused this map with its inscriptions to be engraved for the printer in the form of a screen. "Thus it was made possible for the spectator, sitting at his ease, to survey the whole world at a glance—a feat that could never have been accomplished except by one who carried the map about in his own brain. May we not say that the author is a man who has penetrated the arcana of the universe?"

Ch'ên Min-chih is full of recondite allusions in praise of Ricci's achievement: "Hsi T'ai Tzŭ," he says, "has journeyed over a space of thousands and tens of thousands of *li*, passing through twenty different realms and at last reaching our country, where he has entered the capital and is welcomed morning and evening by Li, President of the Board of Repairs—truly, an extraordinary meeting!"

Yang Ching-shun quotes Chuang Tzŭ: "The limits of an external world are recognized (by the true Sage), but not assigned;" and Tzŭ Ssŭ Tzŭ: "There are things which even the divinely inspired man does not know." After reviewing the attempts of Chinese writers to formulate a system of geography, he eulogizes the profound science of Ricci. From his closing remarks we gather that he was an official colleague of Li Chih-tsao.

Just outside the map on the left-hand side, above the inset of the southern hemisphere, we find the actual imprint:

Chang Wên-tao of Ch'ien-t'ang (Hangchow) passed the paper (over the blocks) on a day in the first month of autumn, 1602.

The inscriptions which surround the outer circumference of the map are mostly short scientific essays or discourses on various subjects. Starting from the title, "Complete Map of the Myriad Countries of the World," at the right-hand corner, we first see a diagram representing the nine celestial spheres and the times of their revolutions, with explanatory notes on the left; then, proceeding downwards, we come to a long in-

* Some characters here are illegible, but the general purport seems to be that the Nanking edition was for some reason or other unsatisfactory.

† This statement is interesting, as giving us roughly the dimensions of the Nanking edition. The words in the Chinese text, however, are "twice double," which might conceivably mean *three* times the previous size.

scription signed by Ricci, in which he discusses the shape and size of the earth. He proves the fact of its sphericity by reference to his own experience at the Cape of Good Hope, where "I still had the heavens above my head and not beneath my feet." He enumerates the five zones and the five continents with their respective boundaries—Europe, Libya, Asia, America, and Magellanica. With regard to the latter, "its boundaries cannot yet be exactly determined, but its northern side extends up to Greater and Lesser Java and the Straits of Magellan." Then follows an explanation of the parallels and meridians. The prime meridian passes through the Fortunate Islands (Canaries); * hence Nanking is situated 32° N. lat. and 128° E. long.

If the latitude of two places, north or south of the equator, is the same, the climate tends to be similar in each. If two places are an equal number of degrees from the equator, only one is to the north and the other to the south, then the four seasons and the length of day and night in these places are equal, the only difference being that the seasons are reversed, and winter in the one is summer in the other. The further from the equator, the greater the inequality of day and night in summer and winter. The sun travels 30 degrees in 1 *ch'ên* (2 hours). Manchuria being 140° E. long. and Burma 110° E. long., it follows that there is exactly two hours' difference in their time. If there is a difference of 6 *ch'ên* between two places, then day and night are reversed (midnight in the one being midday in the other). If the two places are also equidistant from the equator, one north and the other south, then the inhabitants of those places are walking with their feet exactly opposite to each other. Thus, Nanking is in N. lat. 32° and E. long. 128°, and *Ma-pa-tso* † in South America is in S. lat. 32° and E. long. 308°. Therefore the people at Nanking are walking with their heads downwards in relation to the inhabitants of *Ma-pa-tso*. Places of the same longitude have the same time and see eclipses of the sun and moon at the same moment.

On the left of the above is a "Short Discourse on the Four Elements" (the Chinese, it may be noted, recognize Five Elements, namely, water, fire, wood, metal, and earth):

When God created the universe in the midst of space, He began by evolving the four elements out of chaos and assigned to each its proper place in accordance with its inherent nature. The nature of fire is light, so it rose to a position just below the nine celestial spheres and remained there; the nature of earth is heavy, so it solidified and settled down between the heavens and the terrestrial globe; the nature of water is lighter than that of earth, so it rested above

* Trigault (p. 179), speaking of the Shiuhing edition, says, "reiecto insularum Fortunatarum primo meridiano;" but this may simply mean that the prime meridian, as in the R.G.S. copy, did not coincide with the left-hand extremity of the map. On Verbiest's World-map in two hemispheres, which dates from *c.* 1670, the prime meridian is made to pass through Peking. The British Museum copy which I have consulted contains the eastern hemisphere only.

† Mapazo or Maparo appears in many maps of the second half of the sixteenth century as a place on the south bank of the Upper Amazon. It is strange that Ricci should have shifted it so far south.

it; the nature of air is neither heavy nor light, so it remained above the water and the earth, but below fire. What we call earth is the grossest of the four elements, while fire is the purest. The place of fire being near the heavenly spheres, it accompanies them in their revolutions. This is fire in its original state, which is very pure and very hot, but not light-producing. Why is this? It is because there is no fuel or coal, etc., to transmit its light. Once it encounters some external object, its brightness appears and light is emitted. It may be compared with pottery that has been in the furnace for a long time: if you take the fuel away, although the pottery gives out no light, yet its temperature is very high and will readily set fire to other things. All the myriad objects of the world were originally moulded out of the four elements. Furthermore it is said that air is distributed in three several regions—upper, lower, and central. Since the upper region is near to fire, it is always very hot. As the lower region is near to water and earth, and water and earth, being constantly exposed to the rays of the sun, emit a certain amount of heat, the air in this region is just warm. The central region, being equally removed from the upper heat and the lower warmth, is always very cold, and produces frost, snow, etc. Moreover, these three regions of the air differ from one another in their shape. Thus, under the north and south poles, which are furthest from the sun and where the dark or negative principle is paramount, the upper and lower (hot and warm) regions are constricted within a narrow space, while the cold central region is very extensive. Under the celestial equator, on the other hand, which is nearest to the sun, and where the negative principle is insignificant, the contrary is the case, that is to say, the hot and the warm regions are extensive while the cold region is proportionately narrow, as shown in the above diagram.

Below the Jesuit monogram at about "4 o'clock" in the circumference of the map, Ricci quotes a passage from the 'Yüan History' (chap. 52 *ad fin.*) on the varying length of days and nights, which shows considerable scientific knowledge for the fourteenth century, and indirectly confirms the truth of his own conclusions.

On the continent of Magellanica near South America is a table thus explained by Ricci:

Every degree of latitude, south and north of the equator, equals 250 *li* on the earth's surface. With regard to the degrees of longitude running east and west, only on the equator is a degree equal to this. In calculating the rest, the further you go north or south, the smaller the degree; so that these degrees of longitude are all less than 250 *li* in length. An arithmetical table showing the diminishing number of minutes and seconds is appended on the left; for, knowing the breadth of a degree in minutes and seconds, we can find out the corresponding number of *li*.

It will be gathered that this table is one giving the number of minutes and seconds of the equator contained in a degree of longitude under each parallel of latitude. Being assured by Mr. Hinks that the figures would be of interest to geographers, I append the table.*

* A similar table was given by Plancius, whose values for certain selected latitudes are quoted by Dr. Wieder in 'Nederlandsche Historisch-geographische Documenten in Spanje,' p. 162. In some cases they differ from those of Ricci by one second. When

Lat. Degree.	Long. Mins.	Secs.	Lat. Degree.	Long. Mins.	Secs.	Lat. Degree.	Long. Mins.	Secs.
1	59	59	31	51	26	61	29	3
2	59	57	32	50	53	62	28	10
3	59	52	33	50	29	63	27	14
4	59	51	34	49	45	64	26	18
5	59	46	35	49	9	65	25	21
6	59	40	36	48	32	66	24	24
7	59	33	37	47	55	67	23	27
8	59	25	38	47	27	68	22	29
9	59	16	39	46	38	69	21	30
10	59	5	40	45	58	70	20	31
11	58	54	41	45	17	71	19	32
12	58	41	42	44	35	72	18	32
13	58	28	43	43	53	73	17	33
14	58	13	44	43	20	74	16	32
15	57	57	45	42	26	75	15	32
16	57	41	46	41	40	76	14	31
17	57	23	47	40	55	77	13	30
18	57	4	48	40	9	78	12	28
19	56	44	49	39	22	79	11	27
20	56	23	50	38	34	80	10	25
21	56	1	51	37	46	81	9	23
22	[56]*	38	[55]†	36	56	82	8	21
23	[53]*	14	53	36	1	83	7	19
24	54	49	54	[55]‡	16	84	6	16
25	54	22	55	34	25	85	5	14
26	53	56	56	33	33	86	4	11
27	53	28	57	32	41	87	3	8
28	52	59	58	31	48	88	2	6
29	52	29	59	30	54	89	1	3
30	51	58	60	30	0	90	0	0

Ricci adds:

In the table on the right, 60 minutes make 1 degree, and 60 seconds make 1 minute. Applied to the surface of the earth, every degree of latitude equals 250 *li*, and every minute $4\frac{1}{6}$ *li*; so that 1 *li* works out at $14\frac{2}{5}''$, 10 *li* at $2'\ 24''$, 100 *li* at $24'$, 1000 *li* at $4°$, and 10,000 *li* at $40°$.

Coming now to the left-hand side of the map, we find an explanation of eclipses, followed by a proof that the sun is greater than the earth, and the earth greater than the moon. The long inscription extending from top to bottom is mainly an array of figures:

Circumference of the Earth: 90,000 *li*.

Distance from the centre of the Earth—

To the surface of the Earth: 14,318·9 *li*.
To 1st or Moon sphere: 482,522 *li*.
To 2nd sphere (Mercury): 718,750 *li*.
To 3rd sphere (Venus): 2,400,681 *li*.
To 4th sphere (Sun): 16,055,690 *li*.
To 5th sphere (Mars): 27,412,100 *li*.
To 6th sphere (Jupiter): 126,769,584 *li*.

these figures in minutes and seconds of arc are turned into decimals of a degree they should become natural cosines of the latitude, since in Ricci's time the ellipticity of the Earth's figure was not known. A test at every tenth degree shows agreement within two units in the fourth place, which is as good as can be ensured with the number of figures used. Hence the table of cosines used by the author of the above table was correct.

* Mistake for 55. † Mistake for 52. ‡ Mistake for 35.

To 7th sphere (Saturn): 205,770,564 *li.*
To 8th sphere (fixed stars): 322,769,845 *li.*
To 9th sphere (Primum mobile): 647,338,690 *li.*

These spheres enclose one another like the coats of an onion. All are hard, transparent, and colourless like crystal, and sun, moon, and stars inhere in their substance like the knots in a plank of wood.

As to the 28 "mansions" of fixed stars,

Those of the 1st magnitude are 106$\frac{1}{8}$ times as large as the earth.

,,	2nd	,,	89$\frac{1}{8}$	,, ,,
,,	3rd	,,	71$\frac{1}{2}$	,, ,,
,,	4th	,,	53$\frac{11}{12}$	,, ,,
,,	5th	,,	35$\frac{1}{8}$	,, ,,
,,	6th	,,	17$\frac{1}{16}$	,, ,,
	Saturn is		90$\frac{1}{8}$	,, ,,
	Jupiter ,,		94$\frac{1}{2}$	,, ,,
	Mars ,,		1$\frac{1}{2}$	,, ,,
	Sun ,,		165$\frac{3}{8}$	,, ,,
	Earth ,,		36$\frac{1}{27}$	,, Venus
	,, ,,		31,951	,, Mercury
	,, ,,		38$\frac{1}{3}$	,, Moon
	Sun ,,		6,538$\frac{1}{3}$	,, Moon

Hence it can be proved that, if there are men on the 4th sphere and those above it, they cannot see the Earth. The Earth, then, is a mere speck compared with the immensity of heaven.

On the continent of Magellanica, south-east of Madagascar, is a table giving the declination of the sun* in degrees for any day of the year, and alongside are directions for its use in determining the latitude of the place where you are. Thus,

If you are at Peking, and observe that the sun is 72° 25′ above the horizon at noon on the 3rd day after "Little Heat" (one of the 24 solar terms of the Chinese, corresponding to July 7th), you refer to that day in the table and find that the sun is then 22° 25′ north of the equator, the difference being 50°. 50 from 90 is 40, so that the latitude of Peking is 40° N.

Near the left-hand bottom corner of the map is a dissertation on the ecliptic and seasons of the year (partially illegible), with an illustrative diagram.

Enclosed in a circle not far from the South Pole are directions for constructing an instrument (evidently a "home-made" sort of astrolabe) to take the altitude of the North Pole above the horizon. I have succeeded in piecing together the following translation, thanks to the kind help of Mr. Reeves:

Use one side of a level drawing-board either of bronze or of wood, taking care that it is perfectly flat, and the larger the better. In the middle suspend a thread at the end of which is a plummet, in order to obtain straightness, and

* Tables of the sun's declination are to be found in most works on navigation and mathematical geography of the sixteenth century, *e.g.* Medina, Cortes, Apianus and Gemma Phrysius, etc.

through the centre draw a cross line at right angles. The vertical thread represents the direction of the zenith, while the cross line indicates the horizon. From the centre, with a pair of compasses, describe a large circle to represent a [vertical] circle in the heavens. In the cross [*i.e.* at the points of intersection of the two straight lines with the circle] make four marks, each mark to indicate the completion of 90 degrees, so that the total comes to 360 degrees. Using a "time-foot-rule" [? protractor], subdivide one quadrant into 90 degrees; one quadrant thus subdivided is sufficient. If the board is large enough, each degree can be further divided into 60 minutes, giving results of great precision. In the centre fix a "measure-sky-footrule" [sighting rule] which can be revolved. Along the middle straight line of the ruler cut away one half at both ends, in order to read degrees and minutes. On the [revolving] rule, at 20 or 30 [?] from the centre, place two pegs ("ears"), and in the middle of each bore a small hole, taking care that the two holes are in the same straight line, so as to permit you to see through [both at the same time]. At night you are to point [the sights] towards the Pole Star so as to bring it into view. If at any point upon the earth you observe (say) an altitude of 10 degrees, then you know that the North Pole at this spot rises so many degrees above the horizon, and that this spot is so many degrees distant from the Equator.

Finally, in the eastern Pacific there is this note on the equator:

This central line is the line of equal days and nights, and divides the earth into two equal parts. All that lies above it is North, all below it is South. In the countries lying near this line the seasons are each a month and a half in duration, there being eight seasons altogether in the year, two springs, two summers, two autumns, and two winters. The four seasons of the northern region are the opposite of those in the southern region: when it is spring in the north, it is autumn in the south; when it is summer in the north, it is winter in the south. The reason apparently is that the rays of the sun have to travel a greater or lesser distance, respectively.

Turning now to the legends relating to various countries, we will begin with Europe, which is not treated so fully as some other parts of the world. The following general account draws a flattering picture, hardly warranted, unfortunately, by the history of that period:—

The continent of Europe contains some twenty-four states, all of which enjoy a monarchical system of government. They follow no heterodox doctrines, but are reverent adherents of the holy Christian religion, which recognizes one Supreme Deity. Their officials are divided into three classes: the first are occupied with matters of religion, the second with statecraft, the third with military affairs. [. . . .] the five grains, the five metals, and a hundred fruits of the earth; their wine they make from the juice of the grape. [They are clever craftsmen] and all are versed in the elements of astronomy and philosophy. [. . .] they set great store by the five relationships. [. . .] The princes and their subjects are [prosperous] and wealthy. All the year round they are in communication with foreign countries. Their merchants and traders have spread all over the world. In past ages, being 80,000 *li* away, they had no intercourse with China; but in the last 70 years or so communication has been established.*

* The first Portuguese navigator to reach China for purposes of trade was Fernão Perez, who arrived at Canton with seven ships in 1517. Hence we may conclude that this legend appeared in the first edition of Ricci's map (1584).

In Northern Russia is a notice of a "Country of Dwarfs":

The inhabitants, both male and female, are only about 1 foot high. At the age of five they have children, and at eight they are already old. Being constantly devoured by cranes, they have to live in caves in order to escape. Here they wait until the third month of summer, when they come out and destroy the eggs of their enemies, riding on goats.

There is a confusion here between the northern dwarfs who, according to Plancius,* were "in height foure foote as those be of Groyneland" (doubtless Eskimo), and the classical "pigmies" mentioned in Homer and more fully described by Aristotle; these latter were said to inhabit India or Æthiopia.

The various states of Germany have a single king over them all. The crown is not hereditary, but the princes of seven states join in designating one worthy man who is made ruler.

Verbiest makes the same statement in different words. The Baltic is called the Sea of Germany, and the production of amber is mentioned:

The best amber is of a golden hue, the next best is blue, while the red is much the least valuable.

The Rhine flows out of the Danube, and a river connects the Black Sea with the Baltic. Rumania is placed south of the Danube, and Albania is shown between this country and Macedonia. The outlines of Italy and Greece are remarkably crude, considering that Ricci was an Italian. Opposite Rome, we have the following meagre account of the Pope:—

The Supreme Pontiff of this region is celibate, and concerns himself solely with the Christian religion, residing in the State of Rome. He is revered by all the countries of Europe.

Verbiest goes more into detail, and gives an enthusiastic description of St. Peter's in Rome. Of Sicily, it is said that

This island has two mountains, one of which constantly emits great flames, and the other volumes of smoke. This goes on unceasingly day and night.

In the Caucasus there is a Country of Women.

This country also has male inhabitants; but if too many are born, they are put to death.

North-east of this is the country of the one-eyed people. The Dardanelles, Sea of Marmora and Bosphorus are merged into one rather wide channel. Altogether, the geography of Europe is markedly inferior to that of China.

The Island of Trees (Madeira) is half a month's journey from Portugal. . . . The Portuguese† burned down the forests, and it was eight years before they

* This and other quotations from Plancius's great map of 1592 (on which see *Geographical Journal*, 46, p. 159), have been taken from 'Blundevile His Exercises: The Description and Use of Plancius his Mappe,' 4th edn. (1613). It must be remembered that many of the legends were copied by Plancius from Mercator and others.

† Here called men of *Po-êrh-tu-wa-êrh*, not *Fu-lang-chi*. Verbiest's name for them is of Lusitania."

were wholly consumed. Now vines are planted in their stead and good wine is made from them.

The Fortunate Islands (Canaries) produce everything man needs, including grape-wine and white sugar, tillage being unnecessary. The climate is damp without rain.

Passing into Africa (for which Ricci prefers the name Libya), we are told that *Ya-ta-la Shan* (Mount Atlas)

is the highest mountain in the world. When the sky is clear and cloudless, those who are halfway up cannot see to the summit. Men call it the axis of heaven. The inhabitants sleep without dreams, which is very strange.

The *Ya-ch'a-na-ju* are the "Azanagi" of Plancius, or dwellers at the mouth of the Senegal—the Sanaga of the old voyagers.

The inhabitants are of a dusky colour. They readily uncover their bodies and only keep their mouths covered up, either with cloth or with leaves. But they hide their nakedness when they go to battle [. . .]* Only at meal-times do they uncover their mouths.

South of this country is Lake *Wu-pa*, traversed by the Niger, and further east is "Little Libya." The coast of Tripoli is "Little Africa." The Nile is described as

the longest river in the world. It flows into the sea through seven mouths. In this country there are no clouds or rain all the year round, hence the inhabitants are skilled in astronomy. Every year the river overflows, which makes the land very fertile, as though the fields had been manured; so that when the natives sow their crops they reap an hundredfold. The country is renowned for its wealth and abundance.

In Central Africa there is a legend, partly obliterated, which refers to the extraction of civet; this perfume is said to be the sweat emitted by a species of cat: "it is scraped off with stones, and is much used by Europeans." †

Just north of the equator, and not far from the east coast, are *Jén-ho-mi-ti-li* and *Ya-ma-la* (the latter perhaps Am(h)ara in Abyssinia, shown just here in some Dutch maps).

Both of these countries are near the sun, hence the bodies of the inhabitants are burnt black. They wear no clothes, and their hair is short and curly. The land produces no iron, but gold and silver, ivory, rhinoceros horn, and other valuables.

There is also a Country of Black Men, which is placed some 10° further south. The "Sources of the Nile" are marked, oddly enough,

* The text here is a little doubtful. Mr. Heawood has traced this legend to Cadamosto, who sailed down the west coast of Africa in 1455–56. A narrative of his voyage is given in the 'Paesi novamente retrovati,' and in Ramusio's collection.

† Abyssinia and Arabia are known to have been principal centres in the production of civet. See Hirth and Rockhill's 'Chau Ju-kua,' p. 234. According to Plancius, however, the "Muske Cats, which produce ciuet or Zibeth, are brought from the Realmes of Pegu and Tarnassary."

along the bank of a river flowing nearly south from a large central lake into the Indian Ocean. South-west of this lake is the kingdom of Monomotapa, where there is

> a beast with a head like a horse, a horn on his forehead, and an extremely thick hide. . . .

This seems to be a mixture of the rhinoceros and the unicorn. In Plancius, the rhinoceros is only mentioned as occurring in "the Realmes of Cambria [*i.e.* Cambaia, Cambay] and of Bengala."

The Mountains of the Moon run in a south-easterly direction to a point on the sea-coast corresponding roughly to Delagoa Bay. The Cape of Good Hope, as we have seen, bears the name *Ta-lang Shan* or "Great Wave Mountain," the origin of which is doubtful. Mr. Heawood suggests that it may be derived from the "Cabo Tormentoso" (Stormy Cape) of Dias, though he thinks it strange that Ricci should have used this name, which was never generally adopted. The *Ying-fang tê* River, debouching east of the Cape, is evidently the Rio de Infante (so named by Dias after his associate João Infante). Off the coast, we read that

> the sea in these parts is rough all the year round. It contains monstrous fish as big as great junks.

The legend on the southern continent: "Parrot country, so-called from the great number of parrots," may be compared with Plancius: "This is the land of Popeniayes, so called of the Portingals because those Birds in that Countrie are of incredible bignes." The "Psittacorum Terra" had already appeared in Mercator's map of 1569.

Further east, and still between 45° and 50° S. lat., we are surprised to learn that

> this country has many kinds of spices, but the natives are savage and cunning, and trade cannot be carried on with them.

Is this a reminiscence of Plancius's Countrie of Beach (S. lat. 15° 4′ long. 148°), which was "rich in gold, but little frequented by Marchants of other Countries, by reason of the crueltie of the people"?*

Taking Asia next, and working our way eastwards, we come across a legend in Asia Minor (called *Na-to-li-ya*) which unfortunately is undecipherable. Of Palestine it is stated that

> God came down from heaven and was born in this country; therefore men call it the Holy Land.

The Dead Sea is marked, and the accompanying inscription, though very faint, seems to refer to the buoyancy of its waters.

* Beach (also written Breach and Boeach) is a corruption of Polo's Locach or Lochac (probably Siam or Cambodia). Its location on a great southland was due to misinterpretation of Polo's narrative, which largely contributed to the general belief in a southern continent.

Ho-la-pi-ya (Arabia): Frankincense is produced in this country. The shrub is very small and does not occur elsewhere. It also produces a herb called *mo-êrh* (myrrh), used for embalming dead bodies.

The Persian Gulf is called the Sea of *Mo-shêng-ting*.

Pa-êrh-ch'i-ya (Parthia): The country produces jade-stones of all colours, diamonds, and *ya-ch'ing* (raven black) stones.

The name of the Caspian is obliterated. Ricci says that

it is doubtful whether it is a sea or a lake. Its waters are salt, so there is some justification for calling it a sea.

The Sarmatians . . . keep their faces covered up, with the exception of the mouth and eyes. They drink horses' blood. It is their custom to flog those guilty of theft, and then put them to death.

Plancius (following Marco Polo) says that the Tartarians "let their horses bloud, and with that bloud quench their hunger and thirst."

The huge (imaginary) island in the Arctic, north of Siberia, has no name assigned to it, but it bears the following inscription:

In the extreme north of this country there is sun for half the year and no sun for the other half. Consequently, fish-oil is used for burning in lamps to take the place of daylight. The cold is extremely severe, making it difficult for men to travel hither, so that little is yet known as to the inhabitants and natural features of the country.

The other large island, further east, is the home of Yakshas (nocturnal devils) and Vagrant Spirits.

The inhabitants live in holes, clothe themselves in skins, and do not know how to ride.

In this region the cold is so excessive that the sea turns into ice, and the natives pass over it with horses and carts. They scoop out holes in the ice and catch large fish in great numbers. As the five grains will not grow in their country, they eat fish to appease their hunger, burn fish-oil in their lamps, and use fish-bones in the construction of their houses, boats, and carts.

Still further east is the "Northern Ocean":

The books tell us that it contains many islands, but they do not give their number or their names.

In the Country of Disembodied Spirits just within the Arctic zone on the 90th meridian,

the natives go abroad by night and conceal themselves by day. They flay deer and clothe themselves in the skins. Their ears, eyes, and noses are like those of other men, only their mouths are on the top of their heads. They feed on deer and snakes.

In the country called *Ko-êrh-mo*

the dead are not buried, but their corpses are suspended from trees by means of iron chains.

A picture of this will be found in Anthony Jenkinson's map of Russia

included in Ortelius' Atlas of 1570. The next legend is the first we have met that comes from a Chinese source, namely the *Wu Tai Shih* (History of the Five Dynasties in the tenth century):

The Ox-hoof *T'u-ch'üeh* (Turks) have human bodies with the feet of oxen. The river is called the Hu-lu Ho (Gourd River); in summer and autumn the ice on it is 2 feet thick, in winter and spring it reaches to the very bottom, and they are obliged to melt it in vessels over a fire in order to have water to drink.

Shih-ti-ya I-mao wai is the "Scythia extra Imaum" that we hear of in Plancius. The I-mao Mountains are, of course, the Imaus of the ancients separating the two parts of Scythia. "They are so high that if you climb to the top and look at the stars, they appear bigger."

It is customary in this country for a son to kill his parents when they have grown old, and to eat their flesh. By so doing, he is held to be taking pity on their age and infirmity, and he inters them in his own belly because he cannot bear to cast them out on the hillside.

The land of the Tatars is very extensive, stretching from the Eastern to the Western Sea, though the inhabitants do not all belong to a single stock. In general, their occupation is archery and horsemanship. They have no cities or fixed habitat, and they carry their houses with them on carts for the sake of convenience when shifting their place of abode.

North-east of this are the *Yü-chüeh-lü*:

Their country is bitterly cold. The rivers yield large fish, and there are also great numbers of sables, black, white, and yellow. The natives are very courageous.

This legend is also taken from the *Wu Tai Shih*. The *Ti-tou-yü* are a tribe mentioned in the History of the Northern Wei, as is also the more important tribe called *Wu-lo-hou* (a branch of the Uigurs), whose country is "low-lying and damp. The climate is very foggy and cold. The natives esteem courage and are not treacherous."

Several branches of the *Shih-wei* (a tribe of Kitan stock) are located in Eastern Siberia by Ricci, whose information is derived from the *Sui Shu* and the *Wu Tai Shih*. The *Wa-chieh-tzŭ* are enclosed on three sides by the Shih-wei.

They have thick heads of hair and wear skins as clothing. They ride bareback and are good archers. They kill any man they meet and eat his flesh raw.

In the extreme East is the name *Po-êrh-wu*. Plancius has "the plaine fields of Bargu" at this spot.

In the Amur region (the course of which river was unknown at that date) Ricci has the note:

In this country there are great snowdrifts, and men ride on wood (? in wooden sledges) in order to avoid falling into holes. Their occupation is trapping sables, and they clothe themselves in fish skins.

This is taken from an account of the Northern Shih-wei in the *Sui Shu*.

Straits of Anian [Bering Strait]: At this point it was formerly thought that the lands of the two sides of the world were joined together. But now it has been discovered that this great sea intervenes, and that through it one can penetrate to the Northern Ocean.*

The position of many of the Central Asian cities is very peculiar. Thus, Turfan is shown west of Yarkand, and a long way south-west of Samarkand! Owing to the enormous lateral extension of the Black Sea and the Caspian (the latter reaching to about the same degree of longitude as Ceylon), the space available for Turkestan is extremely limited, and Tibet is well-nigh crowded out altogether. At the same time, Ricci gives much more detail than Verbiest seventy years later, who seems hardly to have drawn from Chinese sources at all.

The location of *T'ien-fang* (the old Chinese name for Arabia) north of the Yin Shan, or T'ien Shan, of Central Asia is a curious blunder, which we find repeated in the Ambrosiana Map, except that there it is placed much further west, near the eastern bend of the Obi. The explanation may be that tribute from T'ien-fang was sent to Peking through Samarkand; it is recorded more than once in the Chinese histories that the envoys from these countries arrived in the capital together, and Ricci may have jumped to the conclusion that they were near neighbours.

It is interesting to find Yang Kuan, the famous frontier gate under the Han and T'ang dynasties, more or less correctly placed not far west of Sha-chou (Tunhuang). It is also shown very clearly on the map of China sent home by Ricci in 1584, which Mr. Baddeley mentions on p. 265 of his article. I have discovered that this map bears the date Oct.–Nov. 1555, by which time the gate had already long ceased to exist.†

Not far east of the Yin Shan is the Onon River, with the Tola River and Sari-kihar, Jinghiz Khan's residence, a little beyond. South of this place are the *Wa-la* or Oirats, subsequently known as Kalmuks, Eleuths, and Dzungars,‡ and south-west is the "Karakorum River" or Orkhon.

The Great Wall, though not actually named, is more accurately traced by Ricci than by Plancius, who (following Ludovicus Georgius) places it as far north as the 53rd parallel. It is mentioned by Trigault (p. 328: "immanes illos muros Regni Sinensis Tartariaeque discrimen"), who, however, only gives it a length of 500 *li* (Sinensia stadia quingenta); on p. 546, he raises this estimate to "ducentorum fere miliariorum," which is still far from the truth.

East of the stony wilderness to the east of Khotan there are shifting sands, in which travellers leave no tracks, and consequently they lose their way if they proceed; so they make piles of bones in order to recognize the route. There is no water or vegetation, and much wind.

* On the Straits of Anian see *Geographical Journal*, vol. 45, p. 540.

† For a proof that Yang Kuan was the original "Jade Gate," see *Jour. Roy. Asiatic Soc.*, July 1914, pp. 715 *seq.*

‡ See Bretschneider, 'Mediæval Researches,' vol. 1, p. 159.

The "stony wilderness" is evidently the Taklamakan desert, for which there is very little space on the map owing to the undue length attributed to the Yellow River. The *Hsi-fan* (of north-eastern Tibet) and the K'un-lun Mountains are placed on its eastern bank. It is made to rise in a comparatively large lake (about three times the size of Koko-nor, which is much too small) called the Sea of Constellations.*

A little to the north-west is a still larger lake, the *Chia Hu*. This is the source of four almost parallel rivers: the *An-i-Ho* (Ganges),† which "receives thirty streams and carries golden sand," another flowing through Eastern Bengal, a third called the River of Golden Sand (a name still applied to the Upper Yangtse), which passes through Burma and unites with the fourth before reaching the sea.‡

The middle and lower course of the Yangtse, including the Min River, is fairly well shown, except that the Han River is made to join the main stream a long way above the Tung-t'ing Lake, and even above the "Three (Ichang) Gorges." This feature also appears on the Chinese map of 1555; but in this case, as the river does not pass through Hanchungfu, it is perhaps rather to be identified with the Kia-ling Ho. I observe that Ricci follows native usage in calling the Yangtse simply *Kiang* (the River). Trigault (p. 286) uses the name "Yamsu" and translates it *maris filius*, an error which is still found cropping up at the present day.

An important fact which has previously escaped notice is that China bears the name "Great Ch'ing (*i.e.* Manchu) Empire," showing that the R.G.S. copy must have been printed after the Manchu conquest in 1644. The China Sea (north of Formosa, therefore what we should call the Yellow Sea) is likewise *Ta Ch'ing Hai*. Both the Vatican map (which is undoubtedly of the 1602 edition) and the Ambrosiana map have "Ming" instead of "Ch'ing" in these two places. Moreover, to the east of Hainan there is the following inscription: —

> The Middle Kingdom is renowned for the greatness of its civilization. It comprises all between the 15th and 42nd parallels, and the other parts of the world that are tributary to it include a very large number of States. This World-map contains a small selection of its mountains and rivers, provinces and circuits. For the remainder, which cannot be given here in full, see the Topographies of the Empire and of the provinces.

Instead of *Chung Kuo* (Middle Kingdom) the Vatican map again has *Ta Ming*. These are the only differences, however, that I can discover between the R.G.S. and Vatican maps (I mean, of course, the twelfth

* Cf. Trigault, p. 323: "Id flumen a prima sua scaturigine lacum efficit, quem à constellationibus appellant."

† The *An-jih* River on Verbiest's map is "4800 *li* long, about 5 *li* broad, over 100 ft. deep, and enters the sea by seven channels. Its waters yield golden [sand]."

‡ The lake no doubt represents the fabulous Lake Chiamay of Barros, Camoens, Mendes Pinto, and the map-makers of the time, which was supposed to give rise to the four principal rivers of Indo-China. The name is probably that of the principality of Chieng-mai or Zimmé, on an upper branch of the Menam.

part of the latter reproduced in the 'Commentarj'), with one small exception: in the description of the shifting sands translated above, there is another character, apparently struck out, just before the word "wind" in the Vatican map, for which there is no room in the R.G.S. copy. All the other legends and names correspond exactly, so that we are justified in regarding the R.G.S. map as a re-issue of the 1602 edition, printed from the same blocks after a few trifling corrections had been made.*

Few Chinese towns are given apart from the provincial capitals. Neither Shiuhing,† where Ricci stayed for so long, nor Shiuchow † (Trigault's *Xaucea*) is marked, but we find *Chi* (Kianfu) in Kiangsi, which is undoubtedly the *Chiengan* of Trigault.

(*To be continued.*)

REVIEWS

EUROPE

London and its Environs.— Edited by **Findlay Muirhead, M.A.** The Blue Guides. London: Macmillan & Co.; Paris: Hachette & Cie. Pp. lxvii. and 501. 30 *Maps and Plans.* *7s. 6d. net.*

THIS is the first volume of a new international series of guide books, to be issued jointly by publishing houses in London and in Paris (where they will appear in French as "Les Guides Bleus"). From the general excellence, moderate price, and handiness of this volume, it may be predicted that as the series grows it will—at all events here and in France—probably supplant the once ubiquitous "Baedeker." The demand for the famous German guides will certainly shrink to small dimensions in Allied countries; and it is significant that the editor of this Guide and Mr. James F. Muirhead, one of his collaborators, were formerly associated in the English editorship of the Leipzig "Handbooks."

The difficulty of preparing a comprehensive guide to London at the present time must have been very great; and it might well be thought that the period when many public collections and other "sights" are inaccessible to the public, and when the whole of London life is subjected to abnormal restrictions—these conditions fluctuating from day to day—was the least opportune for such an enterprise. Such changes are, however, as the editor says, "more functional than organic," and the aim appears to be to describe as far as possible the London after the war. This has necessitated a good deal of compromise. The usual descriptions are given of the contents of the museums and picture-galleries, with warnings that some of these are entirely closed until peace-time; while elsewhere the writer even projects himself into the future in such statements as: "during the Great War its [the Tower's] former use as a prison was revived."

The Guide opens with several chapters by various hands upon aspects of

* Ricci writes on 10 May 1605: "Il Mappamondo che mandai doi anni sono, è stato ristampato più di diece volte" ('Lettere dalla Cina,' p. 272). It is not likely that further reprints were made after the publication of Verbiest's World map, so that the date of the R.G.S. copy probably falls between the years 1644 and 1670 or thereabouts.

† Post Office spelling, based on local pronunciation. The Wade spelling is *Chao-ch'ing* and *Shao-chou*, respectively.

London as a whole ; valuable essays, which may be read profitably by those who have lived in London all their lives. These introductory chapters comprise : " History and Administration of London," by the former Librarian at the Guildhall, Mr. Charles Welch ; " British Art," by Dr. D. S. MacColl, Keeper of the Wallace Collection ; " London Architecture," by Prof. Lethaby ; and " Literary Walks in London," by Mr. James F. Muirhead. There is also a useful Bibliography. Of the general texture, so to speak, of the Guide proper no more need be said than that it appears to be extremely clear and helpful, and that an admirable feature is the abundant reference to the literary associations of places and houses, especially with regard to Dickens's works. It should be noted that the word " environs " is interpreted very liberally, and is made to include such outlying places as Tilbury, Burnham Beeches, and Waltham Cross. The maps and plans are also clear and very practical in arrangement. Travellers who have known the annoyance of having to open out and replace large maps on windy days will be pleased to see that here the trouble has been done away with as far as possible ; for the large general map of London and the suburbs which is indispensable to the work has been simply cut into horizontal pull-out strips of the height of the pages, these strips being secured by the left-hand ends.

The volume is not quite free from error. Testing its accuracy as regards one corner of London, the reviewer has noticed two mistakes. On the map facing page 462, as also in the Index, Stamford Brook Station is omitted ; and " Old Mill Lane," mentioned on page 422, should be " Oil Mill Lane." Such however are probably printers' errors and do not seriously impair the value of the work. L. F. G.

Le Bas-Maine : Étude Géographique.— **René Musset.** Paris : Armand Colin. 1917. *With Plates, Maps, and Text Figures.* 15 *fr. and* 20 *per cent. increase.*

French geographers before the war were already noted for the number of detailed and painstaking regional studies which they had produced, on a scale unrepresented here. We congratulate Dr. Musset and his publisher on the proof, which this book affords, that even the war has not been permitted to interrupt the sequence. It forms a notable achievement under present conditions ; but we must add a hope that, in the future, bulky volumes, requiring serious study, will cease to appear in a form such that they promptly go to pieces in the hands of even the most careful reader.

The Bas-Maine is a part of the old province of Maine, practically coinciding with the department of Mayenne ; in other words it is the area drained by the upper part of the Mayenne River, itself a right-bank tributary of the Loire. Structurally, it forms the eastern extremity of the Armorican massif of Brittany, separated from the latter by the desolate region between the valleys of the Vilaine and the Mayenne, which has been a frontier belt throughout history. It shows some resemblance to Brittany in climate, for this is mild and damp, better suited for apples and buckwheat than for corn or vine. A country of large rather than of small properties—" a corner of rural England which has strayed into France "—it is distinguished by the prevalence of the *métayage* system. The department, indeed, forms part of an isolated area in which—and here only—this system is practised north of the Loire. With a naturally infertile soil, and a position remote from main lines of communication, the region has always been backward, a fact reflected in the bad condition of the local roads, and the paucity of local railways.

Its selection as the subject of a detailed study is due to the fact that it is an admirable example of a region of *bocage*. The name, in western France, is given to a deforested area, the special feature of which is the presence of wide and tall hedges between the fields. These hedges, which are intermingled with trees, give the country a characteristically wooded appearance. Further, they affect the economic life in that they permit open pasturage to be carried on, whereas in the unfenced lands to which in western France the name of *plaine* or *champagne* is given, the animals must be herded. Dr. Musset's aim is to trace the evolution of the *bocage* of the Bas-Maine from the primitive forest, and to show the intimate relation which, at every stage of its history, has existed between the physical conditions, the modes of land-utilization practised, and the life of the people.

The Bas-Maine has been peopled from the Palæolithic period onwards, but whatever civilization developed in it in Gallo-Roman times was practically wiped out by the Germanic invasions of the third century and the Norman of the tenth. After the latter it was a desolate region of dense forest, which in the twelfth century became a miniature Thebaid, owing to the presence of numerous hermits. The first deforestations were carried out by these hermits, and agriculture developed step by step until by the sixteenth century the region attained a measure of well-being. Remote and isolated, it was necessarily self-sufficing, and the local agriculture had a triple basis. The remnants of the forests supplied wood, and their acorns fed the pigs, the chief domestic animals. The unenclosed *landes*, derived by degradation from the original forest, supplied gorse, used as fodder for the farm animals, and, by the process known as *écobuage*, the equivalent of the manure which was not otherwise obtainable. This process consists in skimming off the surface soil and adding it to the exhausted fields; the presence of nitrogen-fixing leguminous plants on these open heaths was of course the real, though unrecognized, justification of the practice. Finally, the best of the cleared lands were tilled and grew food for man. Since, however, the soil is deficient in both lime and phosphates, and was not manured except by the *écobuage* process, long periods of fallowing were necessary, and the yield was small.

In the seventeenth and eighteenth centuries prosperity increased with a development of local industries. The first in point of time was the iron industry, and it led to a further great reduction in the forested areas. It was followed by the growth of a domestic linen industry, based upon locally produced flax, which attained considerable dimensions, the linens being largely exported. The industry not only raised the status of the cultivating peasants, who participated in it, but led to the rise of a prosperous bourgeois class, who invested their profits in land and practically merged with the old noblesse. But the wars at the end of the eighteenth century, combined with other causes, resulted in a collapse of the linen trade, and the early part of the nineteenth century was a period of great depression. As the century went on, however, there was a change in agricultural methods which amounted to a revolution. This was brought about by the use of lime to restore fertility to the exhausted fields. Local beds of limestone occur, and there is also local coal which, though poor, was of great importance owing to the use made of it in the kilns. The agricultural revolution was due chiefly to the large proprietors who had obtained, during the industrial period, stores of capital, and were able to supply this to their *métayers*. In this region, therefore, the *métayage* system has proved advantageous to agriculture. With the sudden rise in fertility due to the first application of lime, continual fallowing became unnecessary, and the

landes, previously an essential accessory of the arable fields, could be tilled. Also, with the increased area under the plough and the rise in productivity, it became possible to grow fodder crops on the "good lands," previously reserved entirely for the production of human food. Thus the supply of domestic animals increased, and animal manure became available.

In the latter part of the nineteenth century, therefore, a new prosperity reigned. But there are signs that the first flush of this is fading. Liming was carried to excess, with the usual unfavourable results. Emigration is increasing, for in this country of *métayers* there is little room for younger sons. Dr. Musset is of opinion that depopulation will continue, unless industry can be developed anew in the region: the local agriculture in itself will not support the people. He himself avoids any consideration of the wider issues involved, but it is obvious that the problem is not one limited to the particular region discussed, and we recommend his book to all geographers interested in the question of the relations between agriculture and industry in relatively poor areas. We may add that, perhaps as a result of present difficulties, there is much repetition in the book, suggesting that opportunities for thorough revision of the completed manuscript were not available.

M. I. N.

AMERICA

Evolution of the Dominion of Canada.— Edward Porritt. Yonkers-on-Hudson, New York: World Book Company. 1918.

Mr. Porritt's book is mainly concerned with the government of Canada, and of this he has given us an excellent study, at once full, suggestive, and informing. His long acquaintance with the political life and institutions of both Canada and the United States enables him to penetrate beneath the surface and show us how the political machinery really works. And his extensive knowledge of the history of representive government in England provides him with many instructive comparisons between the institutions of mother-country and colony. The chapters which he devotes to Canadian history before the confederation are also singularly illuminating. They light up the background of modern conditions and show the origin and growth of the forces—social, religious, and economic—whose interplay makes the politics of the Dominion. The substance of Canadian history is to be found in the relations of the two races, French and English, who had to learn co-operation; in the relations of the colony with the mother-country, from whose parental control she had to win her freedom; in her relations with her powerful and progressive neighbour, whose constant influence on her development Mr. Porritt takes pains to illustrate; and in the long struggle with nature which the character of her vast continental territory imposed upon her. The single chapter which Mr. Porritt gives to the description of the economic and geographical divisions of Canada is exceedingly helpful in the light it throws on the political problems which the economic differences of the various parts of the country have created. His account, too, of the origin and development of the national policy is most valuable; and the book as a whole, though not always very carefully written, shows a knowledge and insight into Canadian conditions which make it invaluable for English readers seeking a concise and living account of the politics of the Dominion.

E. A. B.

The Virgin Islands of the United States of America.— Luther K. Zabriskie. New York and London: G. P. Putnam's Sons. 1918. $4 or 20s.

The Virgin Islands: Our New Possessions and the British Islands.— Theodore Debooy and John T. Faris. Philadelphia and London: J. B. Lippincot Company. 1918. $3.

On March 1917 the Danish West Indies became by purchase the property of the United States. Fifty years before, the Government of the United States, led by the experience of the Civil War to feel the need of a naval station in the West Indies, negotiated a similar treaty with Denmark, but the Senate refused to ratify it. And a second treaty for the same purpose, which passed the Senate in 1903, was rejected by the Upper House of the Danish legislature. Spain was the first, Denmark is the second, of the old colonizing nations of Europe to yield her place in the West Indies to the expanding energies of America. But the Danish possessions bore no comparison with those of Spain. They included some fifty or more small islands, of which three only had any importance—St. Thomas for its fine harbour, which made it so long a great distributing centre of trade in the West Indies, and for its strategic position between Europe and Panama; St. John, as the home of the bay tree, from which bay rum is manufactured; and Santa Cruz, "the garden of the West Indies," for its sugar plantations. St. Thomas, which the Danes annexed in 1666, was the oldest of their possessions. Santa Cruz was disputed between the English, Dutch, and Spaniards, and finally fell into French hands, to pass by sale to Denmark in 1733. St. John was annexed by the Danes in 1684, and colonized in 1716. Like other West Indian islands, they have had a very chequered history—subject to the uncertainties of war, climate, and the movement of trade. In war they have suffered less than many of the neighbouring islands, for Denmark was neutral in most of the great eighteenth century wars; but twice during the Napoleonic wars, 1801–2 and 1807–14, the islands were seized by Great Britain. They have been several times devastated by earthquake or hurricane; they have had their share of the troubles—rebellion and riot, which slavery brought in its train; the decline of the West India sugar trade has affected them, though, of economic influences on their prosperity, the most important was steam navigation, which took away from St. Thomas its position as a great distributing centre in the West Indies. Perhaps they were most prosperous in the early part of the nineteenth century before the slaves were emancipated, an event delayed till as late as 1848 in the Danish West Indies. Certainly in 1835 the population was much larger than at the last census, being over 43,000 then as compared with 27,086 in 1911. The annexation of the islands by the United States, with which their commercial relations are already close and extensive, may revive something of this diminished prosperity. Such is the expectation of Mr. Debooy and Mr. Faris, whose joint labour has produced the very readable and admirably illustrated volume before us. They write for the tourist and traveller and the man of business, and their book will be an invaluable companion to visitors to the islands. Mr. Zabriskie's work is more serious. It is solid and full of information on economic and administrative matters, on which the author's experience as American Vice-Consul enables him to speak with knowledge and authority. Its comprehensive treatment and up-to-date statistics make it a valuable handbook to the new possessions of the United States.

E. A. B.

AUSTRALASIA

Americ Vespuce, 1451–1512. Sa Bibliographie, sa vie, ses voyages, ses découvertes, l'attribution de son nom à l'Amérique, ses relations authentiques et contestées.— Henry Vignaud. ('Recueil de Voyages et de Documents pour servir à l'histoire de la Géographie,' xxiii.) Paris: Ernest Leroux. 1917. 32*s*.

The career of Vespucci has probably aroused more controversy than that of any other early navigator, and the judgments of critics have varied within extraordinarily wide limits. While some have regarded him as one of the most skilful pilots and cartographers of his time, others have pronounced him little better than a vain-glorious charlatan. The latter verdict is no doubt unjust, and a work which like the present starts with the avowed intention of rehabilitating the credit of the navigator is valuable as a corrective to such tendency to excessive depreciation. But the *rôle* of a clever advocate maintained by the author throughout lessens the claim of the book to be considered a judicial presentment of the evidence, and may even defeat its own object by putting the reader on his guard against too easy acceptance of the views propounded. Still, the book is undoubtedly one to be read by all students of the question, and it gives evidence of immense industry and knowledge on the part of its author.

In the first part of the book M. Vignaud ably discusses the complicated bibliography of Vespucci's career, treating of the whole history of the early editions of the 'Mundus Novus' and the 'Lettera'—the only undoubtedly authentic sources—as well as the other writings which have been attributed to the Florentine, and the large body of modern literature and reprints, the whole making up a total of 272 items. Even the two first-named documents offer problems which cannot yet be regarded as settled. It could have been wished that M. Vignaud had been able to consider the new arguments lately put forward by Prof. Northup (see *Journal*, vol. 50, p. 377) in support of the view that the letter to Soderini was originally written in Spanish, and that in any case the Italian version of 1505 or 1506 was not the common source of all later editions, but that both it and others—*e.g.* the Latin of Basin and Waldseemüller—derive from a lost original. In this view the Latin version, instead of being a somewhat faulty translation through the French from the known Italian, may sometimes help us to re-establish the sense of the original text. The question has an important bearing on the disputed first voyage, as we shall see presently. M. Vignaud is uncompromising in the view that the existing Italian version is the only one worthy of credence, and it would be interesting to know whether or not Prof. Northup's arguments have left him equally firm in this conviction.

The second part of the book deals with the little we know of Vespucci's life, and with his voyages—the four described in the 'Lettera,' and supposed later ones on which the data are less authentic. It is the first voyage—that of 1497–98—which has caused the most heated controversy. The suspicion cast on Vespucci's veracity has been due to the lack of contemporary evidence in corroboration, and still more perhaps to the subsequent attacks of Las Casas, who, as a partisan of Columbus, would naturally be slow to accept the claims of another to have preceded the Genoese as discoverer of the American Continent. It is impossible to reconcile *all* the statements in the letter with any possible itinerary of this first voyage, but while accepting unhesitatingly all that tends to enhance the extent of the discoveries, M. Vignaud passes lightly over the difficulties, and airily gets over the chief by saying that the text is evidently corrupt—an attitude into which his *rôle* of advocate too often tempts him. He

believes that the expedition in which Vespucci took part (as subordinate) struck the continent at the head of the Bay of Campeachy and afterwards traced the whole contour of the Gulf of Mexico and a considerable part of the Atlantic Coast of the United States. He entirely rejects the notion that the *Lariab* of the Italian version really represents Paria in South America (though this is the reading of the name in the Latin version), declining to attach any weight to the latter where it diverges from the Italian. The coast-lines of the Cantino and Canerio charts are called in in support of the above view, though they are at least capable of another explanation, as was shown by the late Sir Clements Markham. It may be that there is no valid reason for discrediting the narrative, but caution still seems desirable in placing any great trust in its accuracy. As M. Vignaud allows, the letter "n'est pas un rapport qui vise à être complet. C'est un simple lettre à un compatriote qui n'a d'autre objet que de l'interesser."

An examination of the records of the second voyage—that under the command of Hojeda—leads to the conclusion that this anticipated the landfall of Cabral on the Coast of Brazil, and represents the first *Spanish* discovery of that country, though Portuguese navigators, about whose voyages nothing definite is known, had probably been there before. The third voyage, during which the coast of South America was followed down to perhaps 50° (here too the author recognizes that all the figures in the 'Lettera' cannot be accepted as they stand), was certainly a great achievement, though it must be remembered that in none of the voyages was Vespucci in chief command. M. Vignaud of course recognizes this, yet he is somewhat apt to lapse into the implication that the whole or main credit of the results is due to his hero. As regards the later voyages attributed to the Florentine, he wisely hesitates to accept their genuineness, and agrees that in any case they led to no new discoveries.

A chapter is devoted to an estimation of the value of Vespucci's services, which the author is of course disposed to rate highly. By accepting the maximum of new discovery claimed for the first voyage M. Vignaud reckons that Vespucci stands above all the navigators of his time for the extent of coast-line explored in the New World. Even if this be so, the relative merit of Columbus, the pioneer, is in no way lessened, any more than Livingstone, the pioneer, is to be placed after Stanley, the inheritor of the pioneer's mantle. Vespucci's special merit is held to be that he was the first to recognize the independence of America from the other continents and its title to be called a fourth part of the world. We must remember, however, that Vespucci's narrative enjoyed an unprecedented currency through its dissemination by the press, and that it is quite possible that in it he was but voicing the geographical notions of his associates in the voyages. The high estimation in which he was held in his own time is certainly indicated by his appointment to the responsible post of pilot-major to the King of Spain, and we may allow that he must have reached a high degree of proficiency in the acquirements needed for such a post. But high posts do not always go to the best man, and there is little or nothing in his letters to point to his possession of unusual intelligence in matters nautical. In all this we have no wish to insist that M. Vignaud's estimate is necessarily mistaken, but merely to suggest that there may still be two sides to the question, and that the truth probably lies between the extreme positions held by panegyrists and detractors, though possibly nearer the former than the latter.

Another section brings together very completely the whole history of the bestowal of Vespucci's name on the New World, and here there is less room

for divergence of opinion. Finally the texts of all the documents relating to the voyages, authentic and doubtful, are reprinted, and supply the student with the raw material from which he can work out his own conclusions. The book is certainly the most important contribution to the subject that has appeared for many years. Misprints are unfortunately rather numerous, but some excuse may be found in the difficulties of the times. There is a good index.

E. H.

THE MONTHLY RECORD

EUROPE

Water-power in North Italy.

THE question of the utilization of available sources of water-power is everywhere coming to the front, and nowhere more insistently than in Italy, where the difficulties of coal-supply have been heightened by the war at the same time that the need of power has likewise been augmented. Things have therefore moved faster in this respect than might otherwise have been the case. An article by Signor G. Anfossi in the *Annales de Géographie* for May 15 last supplies an opportune summary of the progress so far realized, and is of special interest to geographers from the care which the writer has taken to trace the influence of diverse geographical conditions on the development of water-power resources in different parts of the country. Many will no doubt regret that such development cannot fail to interfere with the scenic charm of the mountain districts which unfortunately, by the nature of things, are just those which also offer the greatest attractions to the hydraulic engineer, but the inexorable demands of modern industry are hardly likely to be gainsaid on such grounds as these. Signor Anfossi points out that enough data are not yet available for the estimation of the total water-power that might be utilized, but he gives the total of the actual concessions for power-use in Northern Italy, which amounts to nearly half a million kilowatts—the bulk naturally enjoyed by Piedmont and Lombardy. The largest share seems to be taken by the textile industries, metallurgy and electro-chemistry coming next, while a certain amount is used for railways and tram-lines. An attempt to estimate the total available water-power has been made by Signor Perrone, who puts down 3,700,000 kilowatts for all Italy, 1,500,000 for Northern Italy, on the basis of the mean discharge of the streams. The Alpine region shows considerable differences in its different parts. The Piedmontese Alps are at a disadvantage owing to the sudden transition from the mountains to the plain without the intermediary of foothills. Communications with the locations of power-supply are not easy; still the perennial glacier-fed water-supply is an advantage, and important power-stations have been established in the valleys of the Maira, Dora Riparia, and Dora Baltea, mostly not far from their lower ends, as well as in the middle and upper valley of the Toce, which possesses excellent communications, though at a distance from the industrial areas. The Alps of Lombardy, with their well-developed foothills, are somewhat better placed, being easy of access, well-watered, and with an industrial population in the lower valleys and adjoining plains. The copious and regular discharges of the lakes also offer unusual facilities. The longitudinal valley of the upper Adda—the Valtellina—is easy of access and provided with abundant water-power, its only drawback being its distance from

industrial centres. In spite of the copious rainfall the Venetian Alps are at a disadvantage on account of the torrential character of the streams (due to the absence of lakes and important glaciers and the more rapid melting of the snow), the want of communications, and the distance from centres of industry. The Apennines region is still worse off, with its more nearly Mediterranean climate, its want of glaciers and great lakes to serve as regulators, the sparseness of the forests, the unfavourable inclination of the slopes, the liability to landslips. It is necessary to form artificial reservoirs, entailing works of great magnitude, but of these eight are actually in working order between Genoa and Bologna, and others are being constructed. Signor Anfossi groups the southernmost ranges of the Alps with the Apennines for the purposes of the study, as they are subject to a more or less similar climatic *régime* and supply power to the Ligurian coast-land. The valley of the Roya boasts of the most important water-power station in Italy, yielding as much as 42,000 kilowatts. The study, which is to be extended to the rest of Italy, ends for the present with an instructive general view of the conditions of the exploitation of water-power in northern Italy.

The Allied Forces on the Rhine.

The attention of Fellows is called to a combined sheet of the 1/M map, now on view in the Map Room, showing the limits for the Army of Occupation laid down in the Armistice signed on November 11, with a 30-kilometre radius round the three bridge-heads of Mainz, Coblenz, and Cologne, and the neutral strip 10 kilometres wide on the right bank of the Rhine, which debars, for the time being, the beaten enemy from more than neutral interest in their vaunted river. The bridge-head sectors so nearly meet that the Allies hold effectively all the most important part of the Rhine's right bank, as well as the whole of the left, which is more than the most sanguine geographer could have thought possible a month ago. Thus the greater part of Frankfort is included in the bridge-head of Mainz; and Düsseldorf, itself neutralized, lies only just outside the bridge-head of Cologne. Combined sheets of the 1/M map serve admirably for showing these remarkable military and political developments, and we hope to have a series of such sheets prepared and shown in the Map Room as the situation develops.

ASIA

Hydrographic Surveys of the Chinese Customs Service.

The Society has received from Mr. S. V. Mills, surveyor and cartographer of the Chinese Maritime Customs Service, the following set of large-scale charts prepared by him from recent surveys of his department on the coast of China: No. 1, North and South Channel Entrances to the Yangtze River, their Approaches; No. 4, Port of Lungkow and its Approaches; No. 5, Taku Bar and the Entrance to the Haiho; No. 6, Min River, outer bar to Pagoda anchorage; No. 7, The Whangpoo—Sheet 1, Woosung to Kaochiao Creek; No. 8, The Whangpoo—sheet 2, Kaochiao Creek to Yangtzepoo; No. 9, The Whangpoo—sheet 3, Yangtzepoo to Lunghua Creek. There is no doubt that these charts are all of the greatest importance for the navigation of these constantly changing waterways, and they are fresh evidence of the valuable hydrographical surveying work now being carried out by the Chinese Customs Service. They show a large number of soundings, with the dates when they were taken, full particulars as to the datum level, as well as much other information essential to mariners concerning lights, tides, currents, magnetic

variation, time signals. Banks and shoals are carefully marked, and care has been taken to make them as complete as possible. No. 1 is a new edition of a chart first published in 1915, and a comparison of the two editions shows what great changes have taken place in the banks and channels of the Yangtze entrance, even in a comparatively short period of time. The lines of soundings on this sheet alone amount to several thousand miles, and some of the areas have not been surveyed for many years. Chart No. 4 is of special interest, as it shows the Port of Lungkow, where the Japanese Army which took Kiaochiao at the commencement of the war landed and had their base of operations. It is interesting to note that to a considerable extent the original drawings of these charts are the work of Chinese draughtsmen. Their drawings have been reduced, photo-lithographed, and printed by the Commercial Press, Ltd., Shanghai. E. A. R.

AFRICA

Development of the Thorn-veld of South Africa.

In a paper printed in the *South African Journal of Science* for November 1917, Prof. J. W. Bews discusses the mode of origin of the Thorn-veld of South Africa—a local variety of Tree Steppe or Tree Veld which is perhaps the most widely extended of all African types of vegetation. He has studied the question in the neighbourhood of Pietermaritzburg, where the former extensive destruction of the Thorn-trees (species of *Acacia*) has of late years ceased in great part, so that the Thorn-veld is again extending over the grass-land. The banks of streams and the numerous deep ravines serve as bases of colonization for the numerous species which, given an opportunity, invade the veld. When such pioneers have established themselves they alter the conditions in the grass-veld and prepare the way for other species to follow. The most important pioneer in the district studied is *Acacia arabica*, var. *Kraussiana*, which as a seedling is little injured by grass-fires, and in its early years is a straggling, irregularly branched young tree, but gradually assumes the umbrella form. Its thorns protect it from grazing animals, and its root-system—a well-developed series of surface roots together with a vigorous deeply penetrating tap-root—helps it in the matter of water-supply. As it takes on the umbrella form it throws enough shade to change the nature of the undergrowth, the soil becomes moister, and earth-worms, termites, etc., more active, thus preparing a suitable seed-bed for fresh species. Of these the earliest arrivals are Jasmines, with *Randia rudis*, *Ehretia hottentotica*, *Euclea spp.*, and others, all with fruits of the fleshy type likely to be eaten by animals and especially birds, of which the lower branches of the thorn-trees are a favourite resting-place. The new-comers may grow up through the thorn-tree, and though the pioneer Acacia mostly remains the dominant form, in many cases it is killed by later arrivals, some of which may become locally dominant. The writer gives a list of over 230 species of trees, shrubs and lianas belonging to the Thorn-veld, with information as to their relative frequency, and distinguishes three main sub-formations. The chief agents of seed-dispersal are birds, ants being also important in the case of species with capsular fruits and small seeds.

AMERICA

Surveys for an Official Map of Uruguay.

We have been glad to receive from Colonel Silvestre Mato, head of the newly organized "Servicio Geográfico Militar" of the republic of Uruguay, a series of papers treating of the steps so far taken to set on foot an official survey for the construction of a complete large-scale map of the republic.

They show that, as in other South American States, a real effort is being made to supply the needs of the public in the matter of a map suited to modern requirements. In a *Boletin* of the "Servicio Geográfico" brought out in 1914, Colonel Mato describes the history of the organization of his department, and sketches its aims and methods. Somewhat the same ground is also covered by him in an address before the "Instituto Historico y Geográfico del Uruguay" in 1917. Until quite lately practically nothing had been done to supply a geodetic basis for the mapping of Uruguay, the existing maps being almost wholly the result of private enterprise. In 1903 a first move was made towards the preparation of an improved map, but even this, which was brought out in 1908 under the direction of Colonel Mato on the scale of 1/200,000, was based only on compilation from existing departmental maps and plans. Not content with this, Colonel Mato continued to work for the establishment of a "Servicio Geográfico" attached to the Army General Staff, and his efforts resulted in 1913 in the passing of an Act creating such a department. The *Boletin* above-mentioned enters into full details as to the methods to be adopted for the field and office work, describing the different class of triangulation with the probable errors admissible for each, the measurement of bases, the instruments to be used, and so forth. The probable errors are given not in angular measure but as ratios of the linear distances, and these vary between 1/100,000 and 1/10,000 according to the class of the triangulation. Such errors, it is shown, will always be inferior to the graphical error of the map. The seven bases measured down to 1914 varied between 7 and 12 kilometres, and the results showed a probable error of less than 1/500,000. Maps are given showing the principal chains of triangulation suggested for the whole republic, and also the complete net of the triangulation of the first, second, and third order for the departments of Durazno and Florida, where the work was first put in hand. The map will be published on two scales, 1/100,000 and 1/25,000, and at the rate at which the work has progressed so far it is calculated that twenty-one years would be needed for the survey of the whole republic if the field work were plotted on the scale of 1/10,000. But for two-thirds of the area a scale of 1/25,000 will be sufficient, so that the time needed should be considerably less.

The Brazil–Uruguay Boundary.

Another memoir received from Colonel Mato describes the survey of the Brazil–Uruguay boundary as modified by the agreement of 1909. It also contains a full verbal description of the boundary as demarcated, with a statement of the co-ordinates of all the points by which it is defined and of the permanent marks set up to indicate them. The official map signed by the commissioners of both parties is also reproduced. The main portion of the new boundary starts from the southern end of the Laguna Merín, at the mouth of the small stream known as the Arroyo de San Miguel, and for the most part traverses the middle of the lagoon to a point opposite the mouth of the Rio Yaguarón, which enters it from the north-west in about 32° 40′ N. lat. At one point, however, the line strikes across towards the western or Uruguayan shore, so as to give to Brazil the Isla Grande (although this lies west of the median line), afterwards returning (by the line of the deepest channel) towards the eastern shore in the vicinity of Punta Santiago before striking across to the mouth of the Yaguarón. This river is then followed upwards, for the most part along its median line, until it is joined on the right bank by the Yguarón Chico, and this in turn by the Arroyo de la Mina, which last becomes the frontier up to its source in the Cerro de Aceguá, S. lat. 31° 52′ 15·54″,

E. long. 54° 9′ 39·32″. The termination is marked by a pillar, the only one situated on the line itself, as all the rest are in pairs, one in Brazilian, the other in Uruguayan territory. The map shows the course of the Yaguarón as surveyed, with the positions of the pillars set up by the Commission or remaining from the old demarcation of 1853. It is not always quite so clear as could be wished, and at the southern end of the boundary does not seem exactly to agree with the text. The memoir goes fully into the methods of survey, and states that the maximum probable error in the triangulation of the Rio Yaguarón is less than half a metre on the ground. By a subsidiary agreement arrived at in 1913 the frontier is defined for a short distance south of the Laguna Merín, from the mouth of the Arroya de San Miguel to the "Paso General" in S. lat. 33° 41′ 22·21″. This modified frontier, which represents less than half of the common frontier of the two republics, seems nowhere to deviate widely from that previously in force, but it is now for the first time laid down with the requisite precision.

GENERAL

A Memorial to William Baffin.

We are glad to learn from Brigadier-General Sir Percy Sykes that he is arranging to erect a memorial to William Baffin at Kishm Island, at the Portuguese fort in whose capture he met his death. The north-west corner of the fort will be built up, and the masonry surmounted by an obelisk. Some Portuguese cannon and cannon balls will be incorporated in the memorial, which will bear the following inscription in English, Arabic, and Persian :

IN MEMORY
OF
MASTER WILLIAM BAFFIN,
who was killed by a small shot fired
from this castle by the Portuguese, in the
Year of our Lord 1622.

The Raleigh Tercentenary.

The Tercentenary of the death of Sir Walter Raleigh was celebrated by an interesting series of meetings in London, organized by a Committee originating from the Shakespeare Association, and of which Professor Gollancz was the moving spirit. On Sunday, October 27, a commemoration service was held in St. Margaret's, Westminster, when wreaths were placed at the altar steps, near the presumed site of the burial, by the Tercentenary Committee and by this Society. On October 29, the actual day of the Tercentenary, a meeting was held at the Mansion House, at which Mr. Edmund Gosse delivered a panegyric on Raleigh, and in the evening the Benchers of the Middle Temple gave a Tercentenary Dinner in their Hall. On this day there were celebrations at Exeter, Woolwich, and other places in England, as well as at Raleigh, North Carolina, and elsewhere in America. A series of addresses on various topics connected with the name and fame of Sir Walter Raleigh have been or will be given at different places during the ensuing weeks. The Tercentenary was also marked by a spirited attempt on the part of an anonymous correspondent of the *Times* to cast doubt on the authenticity of the burial at St. Margaret's, Westminster, and on the strength of a letter written by Lady Raleigh before the execution, to argue that after a brief rest at St. Margaret's, the body was carried to Beddington for burial. Crushing rejoinders by several learned archæologists and historians must, however, have convinced the writer that his case can scarcely hope to succeed.

The Sultanieh Geographical Society.

We have received from the Foreign Office the programme of work issued by the Sultanieh Geographical Society of Cairo, whose new title and increased activities will command the sympathy of all geographers. The Society proposes to extend its sphere of action, and to develop ethnographical studies in particular. For this purpose it has formulated a schedule of inquiries for the use of officials and professional men in Egypt and the Sudan, a copy of which will be placed in our Reading Room. Provision is made for the publication of a Bulletin and Memoirs, as well as for the resumption of a series of lectures, and the improvement of the Society's museum. The Society feels that its scope lies especially in the Nile valley; but inevitably it will find attractions outside that valley in the territories brought under British protection by the victorious conclusion of the war with Turkey. We may look forward with confidence to a rapid extension of knowledge, in which the Sultanieh Society must play a prominent part.

Pierre Poivre, a French Traveller of the Eighteenth Century.

Prof. Cordier has printed for the first time in the *Revue des Colonies Françaises* (1 trimestre, 1918), a *Relation abrégée* of the journeys undertaken by Pierre Poivre between 1748 and 1757 in the interests of French commerce in the Indian Ocean and the East. It was drawn up by Poivre himself, who in spite of his education and literary tastes published, strange to say, no account of his varied experiences, though he has left a good deal of material in MS. He is described by Prof. Cordier as "ce grand voyageur, l'un des plus remarquables que la France ait envoyé en Asie au XVIII^{e} siècle," and his views for the encouragement of French commerce and the development of the tropical possessions of that nation were singularly far-sighted and enlightened, though the unfortunate circumstances of the time rendered them less fruitful in results than they might otherwise have been. The memoir now published occupies some 80 pages, and is a succinct and unvarnished account of his activities on behalf of the "Compagnie des Indes" during the years above mentioned, preceded by a brief statement of the previous events of his life which had led up to his taking service under the company. Member of a well-to-do family of silk-merchants at Lyons, his early bent was towards the mission field, but with this he combined an eager desire to learn something of the nature and productions of the Far East with a view to benefiting his country. In fact, as he honestly allows, the idea of missionary work may have arisen from a natural taste for travel and keenness for new discoveries. Between the ages of sixteen and twenty he devoted himself to the most varied studies to fit himself for the work of a pioneer, and in 1741 sailed for China under the auspices of the "Missions Etrangères" of Paris, though too young for ordination. From China he went to Cochin China, where he spent two years, learning the language and studying the commerce and natural history. Later, having lost an arm in a fight with an English war-ship, he returned to France and placed himself at the disposal of the French East India Company with the twofold object of founding a French commercial establishment in Cochin China and of introducing the highly prized spices of the East into the French islands in the Indian Ocean. Starting with a commission for these ends he was successful in the first, but in endeavouring to compass the second found himself not only left without support, but actually thwarted at all points by intrigues due to a hostile party in the Board of Directors at home. For six years he continued his uphill task, making various voyages between Mauritius and the Far East,

but though he succeeded in bringing living specimens of the nutmeg to Mauritius, they succumbed to the neglect (if not worse) of those to whom they were committed. He returned to France and looked forward to a life of study and retirement, but was eventually (1767) called upon, through changes in the political horizon, to return to Mauritius as governor. His wise measures and whole-hearted devotion to the interests of the colony gave it a new start, and he has been spoken of as worthy of sharing with La Bourdonnais the title of its founder. Through him a number of valuable products of the East were introduced into the island.

The 'Islario' of Alonso de Santa Cruz.

The Madrid Geographical Society, which like that of Lisbon occasionally uses its *Boletin* as the medium for the publication of rare geographical documents, is now doing good service by bringing out the complete text of the above work, with facsimiles of all the maps contained in it, from a MS. preserved in the National Library of Madrid. Two instalments, with a brief introductory sketch of the career of the gifted Spanish historian and cartographer who produced the 'Islario,' have appeared in the first two quarterly issues of the *Boletin* for 1918. Until quite lately it was thought that the only portions of the work which had come down to us were the two last parts of the four of which it is composed. Of these the fourth, relating entirely to America, was brought out in 1908 by Prof. von Wieser (cf. *Journal*, vol. 33, p. 687). It has since been established that the Madrid MS. above mentioned, which bears the name Andrés García de Céspedes as author, is really the work of Santa Cruz, with such alterations only as were needed to bring it into harmony with the supposed authorship of Céspedes and the circumstances of his time. Even the title bears evident traces of the erasure of the original author's name, with the exception of the initial letter A common to him and his successor in the office of Pilot-Major. Other alterations consist in the substitution of Philip III. for Philip II. as the name of the reigning sovereign, and the revision of certain passages inapplicable to the former. The 'Islario' has a wider scope than its title would imply, being not limited to islands, but forming a general compendium of the geographical knowledge of the time and of the principles of mathematical geography. The maps, of which there are a large number, cover a considerable part of the land-surface of the globe, though especial attention is given to the coasts and islands. The introduction supplied by the editor might with advantage have been somewhat fuller, as it leaves several points not quite clear, particularly as regards the relationship between the Madrid MS. and those at Vienna and Besançon used by Wieser. The latter writer placed the date—previously thought to be about 1560—as early as 1541, on grounds which seemed conclusive. The Madrid MS., however, was not completed till after the abdication, in 1556, of Charles V. (who had entrusted the task to Santa Cruz before 1540) and a comparison with a rough draft in the *Archivo de Indias* shows that the Emperor's name had originally appeared in the place of that of Philip II. When, precisely, the existing MS. was completed remains doubtful. In any case it would seem to be later than the version printed by Wieser, and the American maps differ considerably in number, arrangement, and substance from those reproduced by him. Certain points of interest may possibly be brought out by a detailed study of the maps, for though there is some general agreement with the productions of Ribero, Gastaldi, and other prominent map-makers of the time—as well as, for the European coasts, with the earlier Portolan maps—they cannot

be distinctly referred to any one type. The British Isles are fairly well shown for the time as regards the outlines of England and Ireland—far better, in fact, for the latter than in many later maps—but Scotland is far inferior to that of Lily of 1546, engraved in Italy. Other maps of the time also give a better representation of the Eastern Archipelago. Borneo is here labelled "Java Minor," as in some printed Italian maps of this century. The name was applied by Polo to Sumatra, a fact not generally recognized by the early cartographers, who shifted it arbitrarily from one island to another of the archipelago, or even, like Mercator, applied it to an imaginary island in a great gulf of the South-land.

OBITUARY

Lord Forrest.

In Lord Forrest, who died at sea last summer while on his way to this country from Australia, the Society has lost a distinguished Gold Medallist, who received the award at a time when it could still be made for pioneer work in the Earth's unknown regions. His career displayed the somewhat unusual combination of the explorer and the Statesman, or rather the development of the explorer into the Statesman, of which, however, at least one other Australian example—that of Sir George Grey—can be cited. Lord Forrest's fairly long life of seventy-one years was about equally divided between survey and exploration and politics, his entry into the latter dating from about 1883, when as Commissioner of Crown Lands and Surveyor-General of Western Australia he took his seat in the Colony's Executive and Legislative Councils. In 1890, on the inauguration of self-government, he became Premier of the Colony, and after a long tenure of that office eventually entered the Commonwealth Government as Postmaster-General, becoming afterwards in turn Minister for Home Affairs and Treasurer, and latterly Acting Prime Minister in the absence of Mr. Hughes. Ill health compelled him to give up office in March last after receiving the honour of a peerage—the first granted to an Australian—in the previous month. It is with his earlier career as an explorer that we are specially concerned here.

Born in 1847 in the Colony with which his whole life was associated, John Forrest entered the Survey Department of Western Australia, and when only twenty-two led his first expedition into the unknown interior. It was sent out by the Government in 1869 for the purpose of testing the reports of natives that remains of murdered white men had been seen in the interior, reports which it was suggested might refer to members of the lost Leichardt expedition. No trace of such remains was discovered, but in pushing east to 122° 50′ E. long. some good country was met with, though the larger part was useless scrub-covered land with extensive salt marshes—Lake Barlee and others. In 1870 Governor Weld commissioned Mr. Forrest to organize an expedition from West to South Australia, through the country at the head of the Great Australian Bight, known only in the immediate neighbourhood of the coast through the painful experiences of Governor Eyre during his great journey through this region in the reverse direction. Profiting by Eyre's map and descriptions the expedition was successful, Adelaide being reached without mishap in five months. A good deal of new country was examined, and important results ensued in the settlement of the Eucla district, and the construction of a telegraph line connecting Western Australia with Adelaide and so with the general telegraph system of the world. But the whole western

interior of Australia from the outskirts of settlement in the west to the telegraph line in the centre was still quite unknown, and a new task awaited Forrest in the carrying a line from west to east across the heart of this area, by which feat, in conjunction with the journeys of Warburton and Giles, a knowledge of its true character was gained for the first time. Forrest's new expedition set out early in 1874, just after the news of Warburton's success in reaching the west coast from the telegraph line had been received. The experiences of Warburton, who, provided though he was with camels, had only got through the desolate wilderness after the most arduous and harassing struggle, were not encouraging, but there was a hope that in a more southerly latitude the conditions might be more favourable. Pushing inland by way of the Murchison the party found travelling easy and pleasant until the watershed was reached in about 120° E. Thenceforward the difficulties surpassed all expectation, the travellers entering a spinifex desert which extended with hardly a break for 600 miles. The country was wretched beyond belief, and for week after week its fearful monotony was but rarely broken by grassy valleys of small extent. One oasis was found at Weld Spring, in long. 121° 21′ E., which offered a pleasant halting-place, and at last by the middle of August the hilly country already reached by Gosse and Giles from the east was sighted, and in spite of further difficulties from the unusual drought the Peake Telegraph Station was gained on September 30. The total distance travelled, mostly on foot, was 2000 miles, and in presenting the Patron's Medal of our Society to the explorer in 1876 the President expressed the opinion that, since Macdouall Stuart's traverse of Australia from south to north in 1860, no journey of the same magnitude and difficulty had been accomplished as that of Mr. John Forrest and his party, and never had a more conscientious and exhaustive survey of the route traversed been executed.

As Sir John Forrest (for he received the K.C.M.G. in 1891, becoming G.C.M.G. in 1901), he was at the head of the Government of Western Australia at a most important time for the Colony, owing to the discovery of the goldfields, and his judicious measures materially helped it forward on the way of progress. He will long be remembered as one of its most meritorious public servants.

Admiral Sir Albert Markham.

We deeply regret to record the death of Admiral Sir Albert Hastings Markham, K.C.B., who died at his residence in London on October 28, and has thus not very long survived his cousin, Sir Clements Markham, though considerably younger. It is not possible in the present number to do justice to the career of so distinguished a sailor and explorer, whose services have been freely given to the Society's Council for a number of years, and who always had its welfare closely at heart. We hope next month to give an adequate notice by a life-long friend and colleague as an Arctic explorer. Before taking part in the British Arctic Expedition of 1875–76 as Commander of the *Alert*, Sir Albert Markham had seen a good deal of naval service in far Eastern waters and elsewhere, and had also gained some experience in ice-navigation during a whaling cruise to Baffin Bay in 1873. During the expedition of 1875-76, he established a record for "farthest north" by reaching 83° 20′ 26″ N. while in command of the northern sledge party. He subsequently carried out several cruises in northern waters, including one to Hudson Bay and Straits in 1886. Besides writing several narratives of his own voyages he edited the works of John Davis for the Hakluyt Society, and wrote a volume on Sir John Franklin for the 'World's Great Explorers.' Last year he completed an excellent life of Sir Clements Markham.

CORRESPONDENCE

Notes on the account of Commandant Tilho's Journey: 'Geogr. Jour.,' April 1918.

El Fasher, Darfur, Sudan, 6 Sept. 1918.

I HAVE recently seen the *Geographical Journal* for April 1918, containing an account of the work of Commandant Tilho in Tibesti and Wadai, which interested me greatly. I should like, however, if I may, to point out one or two slight errors in it as regards Darfur.

On page 224, lines 22, 23 and 25, and on p. 225, line 17, the place called Kabiya has been shorn of its first syllable. The name is Kabkabiya, or, as we spell it on our maps, Kabkabia.

On page 244, lines 29, 30, Um-Bakur should be Um-Bakhur, the central consonant of the second word in the name being not a *k*, but the Arabic خ, which is usually expressed by the double consonant *kh*.

On the last two lines of page 244, a "nought" has been omitted from the population of El Fasher, which should read fifteen to twenty thousand.

The statement on page 245, lines 11 and 12, that "the last French officer arrived in these parts from the west only twenty years ago" is not strictly accurate, as Colonel Hilaire and Sous-Lieut. Le Mercier came through here from Wadai on their way back to France in March 1917, only four months before Commandant Tilho.

As regards the large lake on the top of Jebel Marra (p. 244, line 35), it may interest you to know that there is not one lake but two. These lakes were visited in March this year by a party of British officers and officials, accompanied very unwillingly by some natives, as they look upon these lakes as haunted. Major Hobbs, West Yorkshire Regiment, who was one of the party, has written a report with a rough sketch of them; and if you think it would be of any general interest, I will ask him to send you a copy.

R. A. SAVILE (Lt.-Col.),
Governor Darfur Province.

We are indebted to the Governor of Darfur for the above notes, and for his initiative in obtaining the account of Jebel Marra which we publish in this number. The passage on p. 245 referred to "the immense change which has taken place in our feelings towards our excellent friends and allies since the last French officer arrived in these parts only twenty years ago." Had we known that two French officers had very recently just preceded Commandant Tilho we should of course have phrased the allusion differently. They will, we trust, appreciate the spirit of the allusion and forgive its literal inaccuracy.—ED. *G.J.*

The Identification of Mountain Peaks.

Referring to the recent article on "The Identification of Peaks in the Himalaya": a similar difficulty occurred in the hills of New Hampshire, U.S.A., known as the White Mountains. As the country is well settled, many mountains were known by different names in towns on opposite sides. There were a half dozen, or more, Black Mountains in the State. Widespread, and often bitter, feelings were excited regarding the two mountains, each of which is known in its vicinity as Mount Kearsarge. The vessel which sank the *Alabama* was named Kearsarge, after one of these, but high naval officers found it impossible to decide which one was intended.

The Appalachian Mountain Club took up the matter in 1876 and proposed a system of nomenclature described in *Appalachia*, vol. 1, p. 7. The State was divided into sections, which were lettered. For the principal mountains a number was added, and a second number for secondary peaks. Thus, L 1, 3 denotes the third summit north of the highest summit of the Giant's Stairs. A map was also published in the same volume in which this notation is added. This system is capable of indefinite extension, and has proved extremely convenient for the detailed study of the mountains by the explorers, surveyors, and geodesists of the club. An elaborate study of the name Kearsarge is given in the same volume, page 152.

The method of indicating a star's position on a map by its distance in millimetres from the left-hand and lower edges is frequently used here (see *Harvard Annals*, **26**, p. 202 ; **72**, p. 72, etc.).

Yours very truly,

EDWARD C. PICKERING.

Harvard College Observatory, Cambridge, Mass.,
10 October 1918.

MEETINGS: ROYAL GEOGRAPHICAL SOCIETY: SESSION 1918–1919

First Evening Meeting, 11 November 1918.

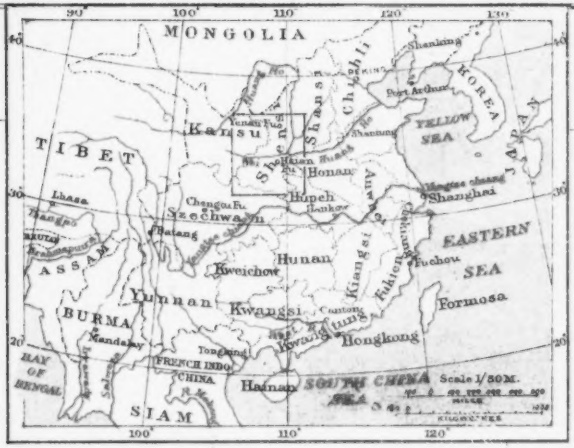
The President announced that the Council had that afternoon passed the following resolutions, which were received with acclamation :

> The President and Council of the Royal Geographical Society, meeting on the day of the enemy's surrender, beg leave to offer to His Majesty the King, Patron of the Society, their loyal congratulations on the victorious conclusion of the War.
>
> The President and Council of the Royal Geographical Society, meeting on the day of the enemy's surrender, offer to Field-Marshal Sir Douglas Haig the congratulations of the Society, who are proud to recognize that the Imperial Armies have been led to victory by one of their Fellows.

At the leading of Colonel Sir Charles Close three hearty cheers were given for Sir Douglas Haig. The President then moved the following resolution, which has been communicated to the representatives in London of the King of the Belgians, the President of the French Republic, the Emperor of Japan, the King of Italy, the King of Serbia, the President of the United States, the King of Rumania, the President of Portugal, the King of Montenegro, the King of Greece, the President of China, the President of Brazil, the King of Siam, and the President of Cuba :

> That this meeting of the Royal Geographical Society, being the first of its Session 1918–19, held on the day of the surrender of Germany to the victorious arms of the Allied Nations and of the United States of America, expresses its thankfulness and pride in the results won by the courage, steadfastness, and sacrifices of the Forces and Peoples of the countries that have combined to defend the cause of national liberty ; and requests the President to convey this resolution to the Heads of the Allied Nations and to the President of the United States.

PAPER : The Road from Baghdad to Baku. Colonel G. S. F. Napier.



CHINA

Map showing Routes in the province of

SHENSI

by

ERIC TEICHMAN, B.A.
(H.B.M. Consular Service)

Scale 1/2,000,000 or 1/ 2M

Miles.

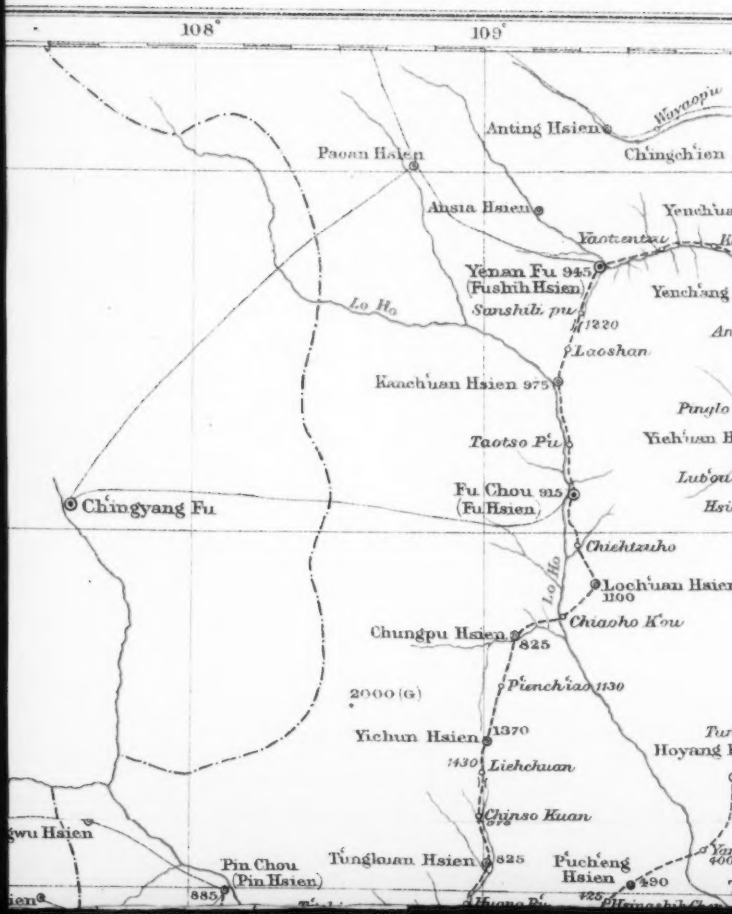
Kilometres.

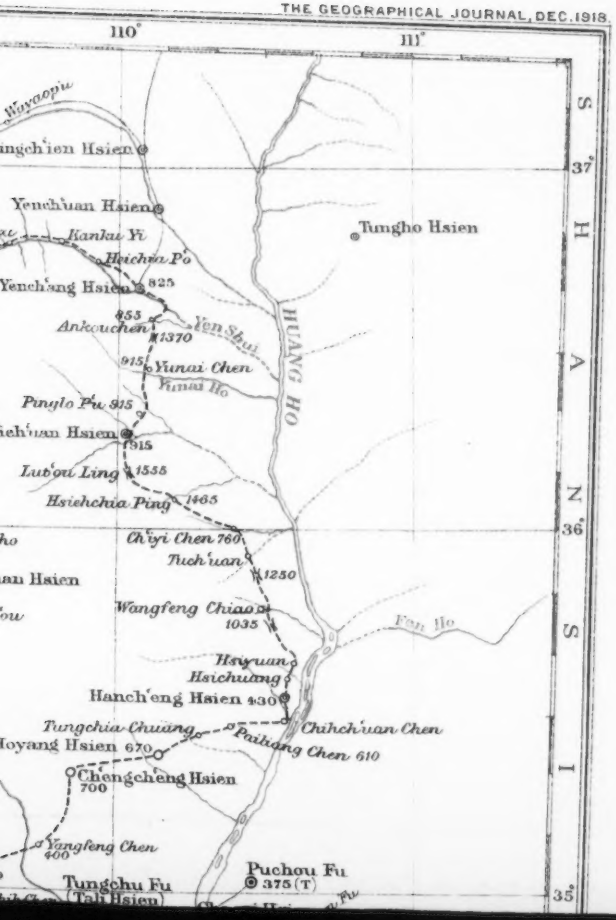
Passes × *Route* - - - - - - - - *Heights in metres*

To Ningkang Fu

Changwu Ha

Lingt'ai Hsien


108°
109°
Anting Hsien
Paoan Hsien
Ansia Hsien
Yenan Fu 945
(Fushih Hsien)
Sanshih pu
1220
Laoshan
Lo Ho
Kanch'uan Hsien 975
Taotso P'u
Fu Chou 915
(Fu Hsien)
Ch'ingyang Fu
Chiehtzuho
Lo Ho
Lochuan Hsien
1100
Chiaoho K'ou
Chungpu Hsien
825
P'iench'iao 1130
2000 (G)
Yichun Hsien
1370
1430
Liehchuan
Chinso Kuan
Pin Chou
(Pin Hsien)
885
Tunglouan Hsien
825
P'uch'eng
Hsien
980
Hoyang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111°
S. SHANSI
37°
36°
35°
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Kanlai Yi
Hsichia Pʻo
Yenchʻang Hsien
825
853
Ankouchen
1370
915
Yunai Chen
Yunai Ho
Pinglo Fu 915
Lubʻai Ling
1555
Hsiehchia Ping
1465
Chʻiyi Chen 760
Tuchʻuan
1250
Wangfeng Chiao
1035
Hsiyuan
Hsichuang
Hanchʻeng Hsien 430
Tungchia Chuang
Paihang Chen 610
700
Yangfeng Chen
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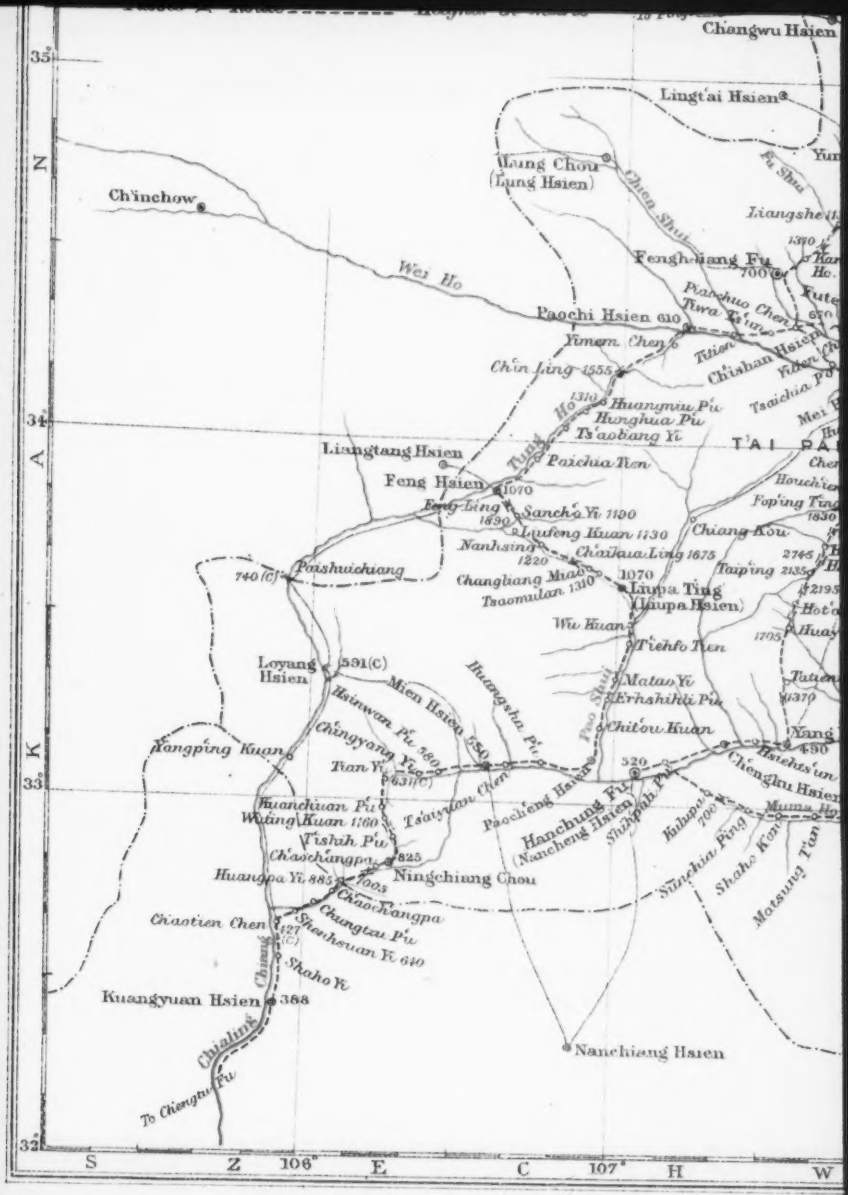
HUANG HO
Yen Shui
Fen Ho


Changwu Hsien
Lingt'ai Hsien
Lung Chou (Lung Hsien)
Ch'inchow
Wei Ho
Fenghsiang Fu 700
Paochi Hsien 610
Yimen Chen
Ch'in Ling 1555
Huangniu P'u
Hunghua P'u
Ts'aobiang Yi
Liangtang Hsien
Feng Hsien 1070
Paichia Tien
Feng Ling
Sancha Yi 1190
Liufeng Kuan 1130
Nanhsing 1220
Chiaikou Ling 1675
Changliang Miao
Tsaomulan 1310
Liupa Ting (Liupa Hsien)
Paishuichiang 740 (C)
Wu Kuan
T'iehfo Tien
Loyang Hsien 591(C)
Mien Hsien 750
Matan Yi
Erhshihli P'u
Chi'ou Kuan
Yangping Kuan
Chingyang Yi 780
Tian Yi 631(C)
Paoch'eng Hsien
Hanchung Fu (Nancheng Hsien)
Kuanchuan P'u
Wuting Kuan 1760
Tsaoyuan Chen
Yishih P'u
Ch'aochangpa 825
Huangpa Yi 885
Ningchiang Chou
Chaotien Chen
Chaokangpa
Changtzu P'u
Shenhsuan Yi 640
Shaho Yi
Kuangyuan Hsien 388
Chialing Chiang
To Chengtu P'u
Nanchiang Hsien
Shuihsi P'u
Kuhupa 700
Shuichia Ping
Shaho Kan
Matsung Tien
Chengkou Hsien
Hsiehts'un
Yang
Tatien
Hua
Hot'a
Tsaochia P'u
Mei
Chen
Houch'ien
Fop'ing Ting
Chiang K'ou
Taiping 2135
Ts'ao Shui
Huangsha Yi
Fu Shui
Liangshe
Yuteh
Chishan Hsien
Titien
Yimen Chen
Paochiao P'u
Hsiangshui Ho
Tung Ho
Yuan Shui
Pa Shui
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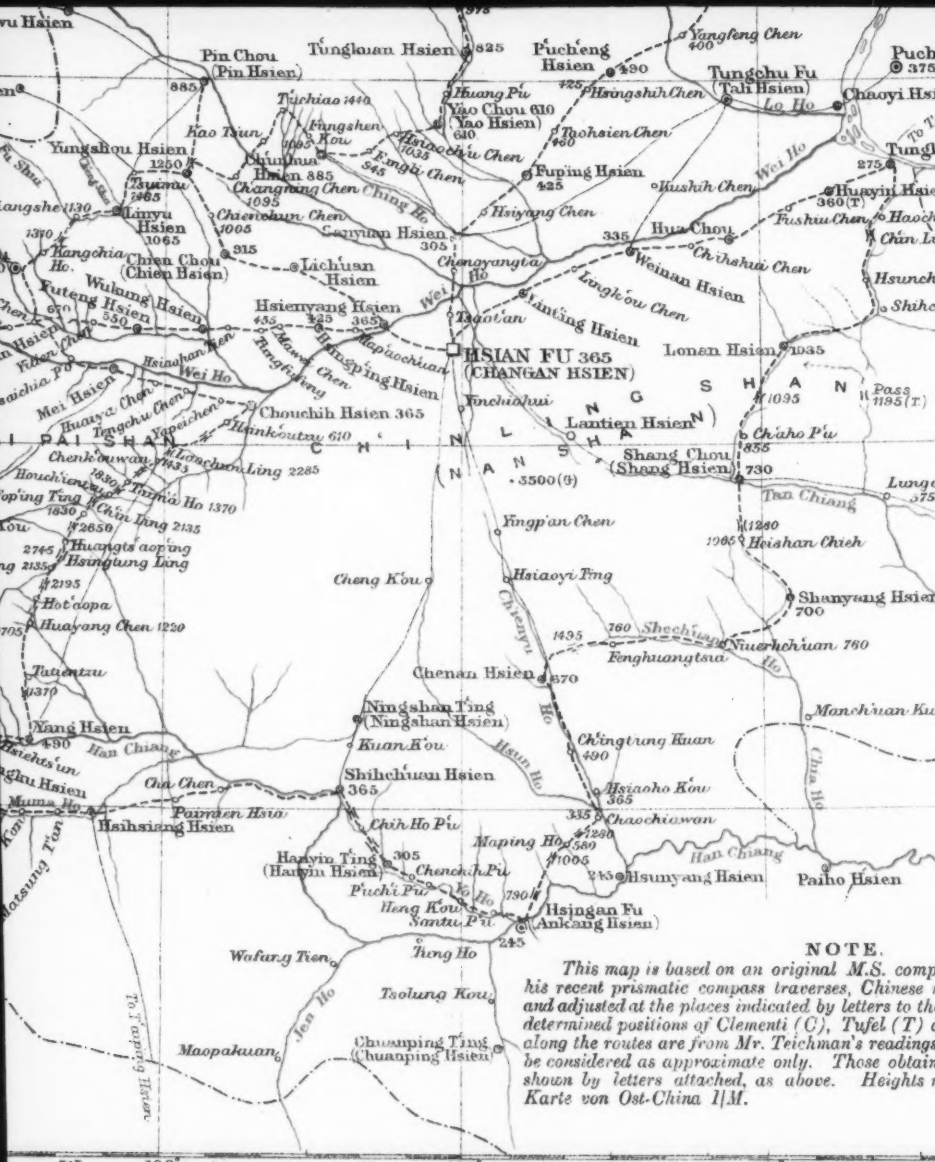

Published by the Royal Geographical Society

E.

M.S. compiled by Mr. Teichman from Chinese maps and local information, tters to the surveys and astronomically ufel (T) and Filchner (F). Heights s readings of two aneroids, and should ose obtained from other travellers are Heights marked (G) are from the

CHINA.
Teichman.

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